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NO. 23.

ANNUAL REPORT
OF THE
ASSOCIATION OF
ONTARIO LAND SURVEYORS
ORGANIZED 1886. INCORPORATED 1892.

AND
PROCEEDINGS
AT THE
SIXTEENTH ANNUAL MEETING SINCE
INCORPORATION

HELD AT
TORONTO
FEBRUARY 25th, 26th and 27th
1908.

Printed for the Association by
THE STEVENSON PRINTING COMPANY
184 ADELAIDE STREET WEST
TORONTO

Patronize Our Advertisers.

NOTICES.

MEMBERS and others will be supplied with copies of the Annual Reports for 1886, 1887, 1888, 1889, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, 1906, 1907, or 1908 upon remitting to the Secretary fifty cents for each copy required.

Copies of the "Manual" may also be had from the Secretary, price fifty cents.

Each member of the Association is reminded of the fact that for the next Annual Meeting a good programme is most desirable and to ensure its preparation it is not now too early to bear the matter in mind.

In addition to its use as a library, the Repository now serves as a drafting room for members when copying Crown Lands plans and notes.

Published annually by the Association of Ontario Land Surveyors. Edition, 1350 copies; price, 50 cents.

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PREFACE.

To the Members of the Association of Ontario Land Surveyors.

The Proceedings of the Association at its Sixteenth Annual Meeting are herewith presented.

Respectfully submitted on behalf of the Council.

KILLALY GAMBLE,

Secretary.

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ASSOCIATION OF ONTARIO LAND SURVEYORS

(INCORPORATED 1892.)

Organized 23rd February, 1886.

OFFICERS FOR 1908-1909.

PRESIDENT.

A. J. VAN NOSTRAND - - - - - Toronto.

VICE-PRESIDENT.

LEWIS BOLTON - - - - - Listowel.

CHAIRMAN OF COUNCIL.

G. B. KIRKPATRICK - - - - - Toronto.

SECRETARY-TREASURER.

KILLALY GAMBLE - - - - - Toronto.

MEMBERS OF COUNCIL.

HON. FRANK COCHRANE, Commissioner Lands, Forests and Mines.

G. B. KIRKPATRICK, Toronto, }
J. F. WHITSON, Toronto. } For Term Ending April, 1911.

P. S. GIBSON, Willowdale, }
C. J. MURPHY, Toronto. } For Term Ending April, 1910.

ALEX. NIVEN, Haliburton, }
H. J. BEATTY, Eganville. } For Term Ending April, 1909.

AUDITORS.

J. J. MACKAY - - - - - Hamilton.
A. T. WARD - - - - - Toronto.

BANKERS.

Imperial Bank of Canada (Yonge St. Branch), Toronto.

BOARD OF EXAMINERS.

G. B. KIRKPATRICK (Chairman).	
G. B. KIRKPATRICK, Toronto,	} For 3 years.
OWEN MCKAY, Walkerville.	
P. S. GIBSON, Willowdale,	} For 2 years.
ALEX. NIVEN, Haliburton.	
THOS. FAWCETT, Niagara Falls,	} For 1 year.
T. B. SPEIGHT, Toronto.	
KILLALY GAMBLE (Secretary of Board).	

NOTE.—Board meets at Department of Lands, Forests and Mines, Parliament Buildings, Monday, 8th February, 1909.

COMMITTEES, 1908-1909

STANDING

- LAND SURVEYING—J. McC. Watson (Chairman), P. S. Gibson, T. B. Speight, W. Galbraith, A. Niven, W. H. Waddell, H. J. Beatty, J. W. Fitzgerald.
- DRAINAGE—J. J. Newman (Chairman), Geo. Ross, R. McDowall, Geo. Smith, C. A. Jones, W. M. Manigault, A. S. Code, J. H. Moore.
- ENGINEERING—Owen McKay (Chairman), J. Hutcheon, E. B. Barrow, J. G. Sing, A. P. Walker, W. E. McMullen, J. D. Evans.
- TOPOGRAPHICAL SURVEY—T. Fawcett (Chairman), J. L. Morris, B. J. Saunders, L. B. Stewart, F. L. Blake, C. C. Fairchild, J. N. Wallace.
- ENTERTAINMENT—L. V. Rorke. (Chairman), H. S. Holcroft, C. J. Murphy, Killaly Gamble, T. D. Green, H. L. Esten, A. J. Van Nostrand.
- PUBLICATION—Killaly Gamble (Chairman), Willis Chipman, A. J. Van Nostrand, J. F. Whitson, H. de Q. Sewell, W. A. McLean.

SPECIAL

- LEGISLATION—G. B. Kirkpatrick (Chairman), Jas. Dickson, J. W. Fitzgerald, M. Gaviller, P. S. Gibson, C. A. Jones, A. Niven, Jas. Robertson, T. B. Speight, E. T. Wilkie.
- REPOSITORY AND BIOGRAPHY—H. L. Esten (Chairman), C. Unwin, G. B. Kirkpatrick, J. F. Whitson, Killaly Gamble.
- EXPLORATION—H. W. Selby (Chairman), J. W. Tyrrell, L. V. Rorke, T. B. Speight, H. B. Proudfoot, W. W. Stull, A. T. Ward.
- POLAR RESEARCH—Willis Chipman (Chairman), L. B. Stewart, O. J. Klotz, Thos. Fawcett, J. W. Tyrrell, J. F. Whitson, J. L. Morris.

Programme of the Association of Ontario Land Surveyors

(INCORPORATED)

AT ITS SIXTEENTH ANNUAL MEETING HELD AT TORONTO,

FEBRUARY 25th, 26th AND 27th, 1908.

PROGRAMME

Tuesday, 25th February—Morning, 10 o'clock.

AT THE REPOSITORY, PARLIAMENT BUILDINGS.

Meeting of Council of Management.

Meeting of Standing and Special Committees.

Afternoon, 2 o'clock.

President's Address.

Thos. Fawcett.

Report of Council of Management.

Report of Secretary-Treasurer, (including Financial Statement).

Report of Board of Examiners.

Report of Committee on Publication.

Report of Committee on Topographical Survey.

Paper—"Some Thoughts on the Origin of Earthquakes." F. W. Wilkins.

Evening, 8 o'clock.

IN MASSEY HALL

Lecture by Commander R. E. Peary, U. S. Navy. "Nearest the Pole."

Wednesday, 26th February—Morning, 10 o'clock.

AT THE REPOSITORY, PARLIAMENT BUILDINGS.

Report of Committee on Repository and Biography.

Report of Committee on Engineering

W. M. Davis, Chairman

Paper—"Concrete in Municipal Work,"

James Hutcheon

Paper—"Reinforced Concrete in Highway Bridges and Culverts."

O. McKay

Paper—"Preliminary Location of Curves in the Bush."

R. Laird

Paper—"Railway Rights of Way in New Brunswick."

W. E. McMullen

Report of Committee on Drainage.

A. S. Code, Chairman

Paper—"Drainage and the Drainage Acts."

C. A. Jones

Afternoon, 2 o'clock.

Report of Committee on Exploration.	H. W. Selby
Report of Committee on Land Surveying, and Question Drawer.	J. M. Watson
Paper—"City and Town Lots."	S. Bray
Paper—"Our Timber Resources and Losses by Forest Fires in Ontario."	J. F. Whitson
Paper—"An Old Timer's Holiday."	C. Unwin
Report of Committee on Legislation.	G. B. Kirkpatrick, Chairman

Thursday, 27th February—Morning, 10 o'clock.

AT THE REPOSITORY, PARLIAMENT BUILDINGS.

Report of Auditors.	
Report of Committee on Polar Research.	Willis Chipman
Report of Committee on Entertainment.	Killaly Gamble, Chairman
Paper—"The Peace River District."	H. W. Selby
Nomination of Officers—President, Vice-President, Secretary-Treasurer, Auditors, two Members of Council.	
Unfinished Business.	
New Business.	
Adjournment.	



MR. AUBREY WHITE

Assistant Commissioner of Ontario Crown Lands and Deputy Minister of Lands and Forests from 1887.

Born in Omagh, Tyrone, Ireland, 1845, and came to Canada, 1862. Was for some years engaged in the lumber business in Muskoka District. Entered the service of the Government as a Forest Ranger, 1876; as Crown Land Agent at Bracebridge, 1878; as Chief Clerk in the Woods and Forests Branch of the Crown Lands, 1882, and has been assistant Commissioner and Deputy Minister since 1887.

Mr. White, during his long association with Land Surveyors, has been at all times a warm friend and his presence at the annual gathering of the Association is always welcome.

Minutes of the Sixteenth Annual Meeting
-OF THE-
Association of Ontario Land Surveyors

HELD AT THE REPOSITORY, PARLIAMENT BUILDINGS,

ON THE 25TH, 26TH AND 27TH FEBRUARY, 1908.

At 2.30 o'clock p.m. the President called the meeting to order, and said:

Gentlemen, as we have an important meeting this evening, and quite a long programme before us, I think we had better proceed to business. The first item on the programme is the President's address, and as I am not accustomed to speaking in public in the ordinary way, I will read the few remarks which I have written.

Mr. Kirkpatrick—I notice you refer to Australia and New Zealand and Cape Colony as foreign countries. I would respectfully suggest that the term "sister colonies" be substituted.

The President—I will adopt your suggestion.

Mr. Kirkpatrick—I think this Association should make some representation to the Dominion Board of Examiners, urging them to utilize that section of their Act regarding examination in a more generous spirit than appears to be shown by the remarks of the Surveyor-General of the Dominion. I wrote to him about this when the question first came up, and I pointed out what the President had said, that the standard of examinations in Ontario was higher practically than that of the Dominion, and, in fact, that it required a knowledge of a great many subjects that the Dominion Land Surveyor did not necessarily have to know anything about. He replied that he did not consider that the examinations in any of the Provinces were sufficiently high; the best thing to do would be to appoint a Dominion Board covering all the Provinces. I wrote to every one of our Senators, sending them a copy of the examination which the Ontario Land Surveyors had to undergo, and I pointed out to them this clause in the Dominion Act, and said that there was nothing to be taken exception to but the footnote that had been put in. I then pointed out that to say it was "only proposed to admit surveyors from Cape Colony, Australia

and New Zealand, where the examinations were high," was a direct slur upon our Provincial Boards. I wrote to Mr. George McPhillips, who is interested in the Manitoba Board, and I sent him a copy of the Act, and he replied to me that they were taking action there, but he didn't know exactly what they would do in the matter. He is not now an active member of the Association, as he is employed on the C. P. R. permanently, but he said they would do what they could, but they hadn't interviewed any of the Dominion Senators there. The matter came up in the Senate, and Senator Kerr introduced a motion that the examination should be reciprocal in the different Provinces, but his resolution was voted down. Senator Sutherland, of Kingston, said he thought no good man would shirk an examination. I would like to know whether Dr. Sutherland, who is not a young man now, could come up and pass the examination he had passed forty years ago. He would probably be plucked, although he is a very distinguished Doctor now. I heard the other day from the Honorable G. W. Ross. He wrote me that the Surveyors' Bill passed the Senate with the elimination of Clause 32. He said he had made an effort to get an amendment to the Bill by which Provincial Surveyors, on passing an examination in the Act, with regard to Dominion Surveys, should be admitted to the standing of Dominion Surveyors without any further examination, but the Secretary of State strongly opposed any amendment, so the clause remained as in the original Bill. I think this Association should send a strongly but politely-worded letter to the Dominion Board of Examiners. Dr. Klotz is one, and Captain Deville is another, and I think Dr. King, and I am sure Dr. Klotz will take a proper view of the matter. Captain Deville said all those surveyors who had passed before 1872 and become associated with Dominion Surveyors were not qualified, and I think it quite possible, if some of the older men were to go up for the Dominion Land Surveyors' examination, they would not pass; but to say that the younger men who have passed a first-class examination here could not get through seems nonsense to me. I have heard of young men who read the Dominion manual on the train going from here to Ottawa for the first time, and on getting to Ottawa passed the examination with flying colors. Now, no man has ever passed the Ontario examination who only read the Survey Act as he came up on the train; of this I am quite confident!

Mr. P. S. Gibson—It occurs to me there may be a little feeling in the matter on the part of Capt. Deville.

The President—Was the matter brought up at all at the Dominion Association meeting?

Mr. Selby—No.

The President called for the report of the Council of Management, but as the report was not yet prepared, it was left to be brought on later.

The President called for the report of the Secretary-Treasurer.

The Secretary—The programme has been altered a little this year. The report of the Council of Management should include the Financial Statement.

The receipts for the past year have been larger than usual, but I regret to say it has been due in a measure to the efforts of our solicitors, who have been obliged to take legal steps to collect the fees in the case of many of our members.

It was moved by Mr. Van Nostrand, and seconded by Mr. Brown, that the Financial Statement be submitted to the Auditors and the whole report be dealt with later.

The President put the motion, which on a vote having been taken, was declared carried.

The President called for the report of the Board of Examiners. (Report read by Mr. Kirkpatrick).

Mr. Kirkpatrick moved, seconded by Mr. Gibson, that the report of the Board of Examiners be received and adopted.

The President put the motion, which on a vote having been taken, was declared carried.

The President called for the report of the Committee on Publication.

(Report read by the Chairman).

The Secretary—I have tried repeatedly to get advertisements from different firms, but I find my efforts are not very successful. They always have something to urge against advertising. I think a professional agent might do much better. Of course we would have to give him, for the first year at least, a large percentage of the amount collected.

Moved and seconded that the report be received and adopted, and the President declared the motion carried.

The President called for the report of the Committee on Topographical Survey, but as Mr. Stewart was not present the matter was left over to be taken up at another session.

The President—Mr. Wilkins is not here, but he has sent me his paper on "Some Thoughts on the Origin of Earthquakes," and I will read it.

The President announced the arrival of some catalogues of E. R. Watt & Son, instrument makers in England, and stated that a branch office had been opened in Winnipeg, where repairs would be made. Mr. Watson mentioned that this establishment had been found most efficient for repairs by Ontario Land Surveyors passing through Winnipeg.

The President called for the paper by Mr. Laird, entitled, "Preliminary Location of Curves in the Bush."

The President—This paper is an important one, and when it is printed we will be better able to go into it thoroughly and see the real value of it.

The President announced Mr. Peary's lecture, to be followed by a supper in the great explorer's honor.

The meeting then adjourned till the following morning at 10 o'clock.

MORNING SESSION, WEDNESDAY, FEBRUARY 26TH, 1908, 10.30 A.M.

The President, Mr. Thos. Fawcett, called the meeting to order and said: Gentlemen, as the Chairman of the Committee on Repository and Biography is not here, and Mr. Davis, who is Chairman of the Engineering Committee is absent, we will take the next paper on the programme, "Concrete in Municipal Work," by Mr. James Hutcheon. (Applause).

The President—As there is another paper on the same subject, it would be well, perhaps, to have it read at this stage; it is a paper by Mr. Owen McKay on "Reinforced Concrete in Highway Bridges and Culverts." Mr. McMullen will read this paper and then the two can be discussed together.

Mr. McMullen—Mr. President and Gentlemen, I am sorry I have not had an opportunity of reading this paper over first. However, it is typewritten, and I trust I will be able to read it intelligibly.

The President—Gentlemen, the two papers that you have listened to are now before you for discussion. They are very practical papers from an engineering point of view, and there are some valuable hints for the members of our profession engaged in that kind of work.

If there are no further remarks, we will proceed with the next

paper on the programme, that is, Railway Rights of Way in New Brunswick, by Mr. W. E. McMullen.

Mr. McMullen then read his paper.

The President—Gentlemen, you have heard this delightful paper, interesting and instructive, just such as we like in our Report. It is now open for remarks.

The President—This is a subject in which most of the gentlemen present have had considerable experience; if there are any other remarks we will be glad to hear them.

The President then called on the Chairman of the Drainage Committee to present his report.

Mr. A. S. Code presented the report.

The President—Gentlemen, you have heard the report of the Drainage Committee, what is your will with reference to it? It is open for remarks from those interested in the subject of drainage. There is another paper which comes under this part of the programme this forenoon, and that is "Drainage and the Drainage Acts," by Mr. C. A. Jones. Mr. Newman will read that paper, and any discussion can come on, after lunch.

Mr. Newman then read the paper.

The President—It seems too bad that we have had those two valuable papers when so many of the members who are engaged in that kind of work are not present at this particular time of the day. Our programme for the afternoon seems to be pretty well filled. There are two or three present here who would give us their ideas on these papers if we would remain a few minutes longer. The Chairman of the Drainage Committee comes from a part of the country where there is a good deal of it and has done a great deal of this work; and Mr. Bolton there, I guess, has been engaged in that kind of work to a considerable extent, and perhaps some others will give us some ideas.

Mr. Bolton—It is getting rather late and I have not very much to say.

12.45 p.m. Adjourned to 2.30 o'clock p.m.

AFTERNOON SESSION, WEDNESDAY, 2.30 P.M.

The President called the meeting to order, and said: The first thing on our programme this afternoon is the report of the Committee on Exploration. Mr. Selby will give us that report.

Mr. Selby—Mr. President and Gentlemen: This report is not a regular report of the committee; we could not get the committee together owing to the absence of our Chairman (Mr. Speight), and Mr. Niven is not here, so we have been unable to have a meeting.

The President—If there be no remarks on this report, I will declare it adopted.

The next item on the programme is the report of the Committee on Land Surveying, by Mr. Watson.

The President—We have another paper touching the same subject.

Mr. Watson then read the paper.

The President—Is there any further discussion on these papers? Mr. Watson has demonstrated his position pretty fully as he went along in reading his paper. As to the Question Drawer, I think it is usual for the Committee on Land Surveying to submit the questions in the Question Drawer with their answers attached, and then when it comes before the general meeting the gentlemen who do not agree with the answers are at liberty to attack them.

Mr. Watson—I don't know whether that is the order or not, but if those things should be put in you have got to have some machinery to make the committees meet. Mr. Fitzgerald is the only man present on that committee. Until a month ago, when I got notice, I didn't know I had anything to do with the committee. As far as the whole Association is concerned, I think the committees should meet here three days ahead of the Association meeting and thresh out these things, instead of coming down here when the business is up for discussion with no time to discuss anything. In fact, the meeting is too short for what is in front of it. You read papers, and unless the members have a lot more intelligence than I have they can't discuss them. Those committees should meet, in my opinion, and should discuss these things and get something in form. There is a lot to be done in legislation and a good many other things, but you can't do it in a minute.

The President—We all agree with what Mr. Watson has said, and it has before this been suggested that the papers read at one meeting might profitably be discussed at the next.

Mr. Watson—If it were a question of allowing them their expenses, I think it would pay the Association to do it. There is too much matter to discuss in the time devoted to it, in my opinion.

Mr. Green—With regard to this Question Drawer, while I am an old Provincial Land Surveyor, yet I am a junior in the practice

of it; as you know, I have been practising Dominion land surveying. Now these questions are all very practical, but outside of the first question there is not an answer given to a single question.

Mr. Watson—I think that would come under what I said. There is no practical discussion. It should be discussed in committee.

Mr. Green—That is what I say. The President and you have just mentioned what I spoke about. These questions, I presume, will come out in the report, and the discussion, and if there is no answer to the questions. Of what benefit is it?

Mr. Van Nostrand—There seems to me to be a good deal of misunderstanding about this matter. In the past, and I think right up to the present time, these questions that have come before the different committees have been taken hold of by the committees themselves and threshed out and answers given, and the answers have been read with the questions and then discussed by the Association. I don't know that it has been customary to take a vote and amend the answers, but it appears pretty clear usually as to whether it is the feeling of the Association that an answer is correct or not. In this case the answers have not been given, and it seems to me we have been spending our time rather fruitlessly, but it arises from a misunderstanding of the way matters should be conducted. With regard to the assembling of the committees here in advance of the Association meeting, I am afraid that is scarcely practicable with the funds that the Association have at their disposal, and we must cut our coat according to our cloth. If the chairman of each committee takes the matter seriously he has usually notice in April, when he is appointed, that he is chairman of a certain committee, and the members are so and so. Occasionally these notices may not reach him, and it may be so in this case. But in any case, if he is interested in the work he has it all published in the report. On the first pages of the report the committees are set forth, and if we were all in earnest and looked over them, we would see where we belonged and what our duties were to the Association. Then the chairman, of course, having the chief responsibility, would submit these questions by correspondence to the different members with suggested answers, or ask for opinions, and I think in that way we would be able to get pretty definite results. I know I have seen land surveying committees here, sometimes in the presence of outsiders, taking in men who are not members of their particular committee, and discussing the questions thoroughly in the ante-room and then producing the questions with the answers. The chairman has not been familiar with the way that work has been done in the past, and could not be expected to exactly

follow the routine, but I think the old method works out fairly successfully, and then as a result we have answers to these very interesting questions which have the approval of the members here at the meeting. That is, of course, the only way to get benefit from them. The discussion is of a desultory character usually, and, as Mr. Green says, there is nothing definite at the end, unless there is an answer which is either upheld or amended. I would suggest in this case, since the discussion has taken place, the chairman should be asked to put down the answers that seem to have resulted from the discussion and from the work of the committee, and that will be probably the best we can do, and will be pretty satisfactory, too, and those answers could appear in the published report.

Mr. Watson—I don't think, as far as the Question Drawer is concerned, that the answers have been satisfactory at all; and as far as correspondence is concerned, a person is very often busy, but I think it would pay for this Association to have their committees meet time enough before the meetings to discuss these matters. I came down here yesterday, expecting to meet my committee. I didn't know I was on that committee before, because I had not examined my report minutely enough to know. I didn't know I was on any committee until Captain Gamble notified me of the date of the meeting. However, I think this Association can well afford to have its committees meet beforehand, and then they might do something, instead of having so much discussion that is very largely fruitless.

Mr. Van Nostrand—The committees are carefully selected by the Council, and of course we all know they are very busy men and have their own affairs to attend to, and a great many do not take the matter seriously, and it is only when they come to the meeting that they drop their own affairs and attend to the affairs of the Association, and that is natural, though I think it would pay the individual members and the Association as a whole to take a more active interest than has been the case in the past.

Mr. Watson—How would it be if I were to correspond with the members of the committee and find out what their opinions are?

The President—If Mr. Watson will do that, and have the answers incorporated in the report, I think that will be better.

The next paper on the programme is one on "City and Town Lots," by Mr. S. Bray, which will be read by Mr. MacKay.

Mr. MacKay then read the paper.

The President—Are there any suggestions on the contents of this paper?

Mr. Van Nostrand—I think, Mr. President, Mr. Bray's is a valuable suggestion, and some steps should be taken to have a measure introduced in the statute whereby an officer of a municipality should first revise the plan before it is put in the Registry Office if it departs from certain limitations. That is to say, put the lots on the same footing as streets now are. Of course, as regards the height of buildings, it is within the power of the municipality to enact a by-law regulating the height, and that we have already machinery for. I don't see that we require anything further, but if the Legislation Committee would take up the matter and make a suggestion to the Legislature here, I think something could be done in the matter. I move, seconded by Mr. Bolton, that the paper be received and published in the Proceedings.

The President—The next paper is one by Mr. Whitson on "Our Timber Resources, and Losses by Forest Fires in Ontario." (Applause).

Mr. J. F. Whitson then read his paper.

The President—The Association is very much indebted to Mr. Whitson for the very valuable, complete and exhaustive papers which he has prepared for us year after year, and I am sure we will appreciate Mr. Whitson's kindness and the trouble he has taken in getting together this information for our benefit, and it adds much to the value of our Reports. If there is any gentleman who wishes to make any remarks on this subject, we will give him a few moments.

Mr. Selby—I move that this valuable paper of Mr. Whitson's, which we have listened to with a great deal of interest, be received and printed in the Proceedings of the Association. Mr. Whitson is deserving of the thanks of this Association for the labor he has devoted to it.

Mr. Bolton—I have very much pleasure in seconding the motion. I am sure we have all listened with very much interest to Mr. Whitson's paper.

The President put the motion, which was carried amid applause.

The President—I see we have with us Prof. L. B. Stewart, and he is Chairman of the Committee on Topographical Surveys.

Mr. Stewart—I am sorry I have not my report in shape yet. I didn't know until yesterday I was chairman of the committee,

and I have been busy ever since in collecting material, and I hope to have it ready for the Association before it disperses; if not, I will be able to get something in shape and send it round to the members of the committee, who may send back their remarks and suggestions and then the report can be got ready for publication.

The President called on Mr. Unwin to read his paper on "An Old Timer's Holiday."

Mr. Agar—My uncle has asked me to read this paper for him, which I am very glad to do.

The President—We have listened to this paper with very great pleasure, and I am sure it will be read in the Report with interest. We enjoy these papers, especially from these old timers. It is open for any gentleman to make any remarks with reference to this paper. We are very much indebted to Mr. Unwin.

Mr. Van Nostrand—Mr. Chairman, this paper has been particularly interesting to me. I know some of the spots, though I have visited them much more recently than Mr. Unwin. I can vouch for the fact that the University is not there. There are not many of us in the room here who will be able to go back, after an absence of 59 years, and visit the scenes of our earliest experiences in land surveying; in fact, I doubt if there are any of us; and in addition to that 59 years we look forward to a good many years of good, honest work from Mr. Unwin in the practice of his profession. He entered it on the 12th April, 1852; he has planted a great many stakes since that time, and even to-day, when we come across his stake and are told it is Mr. Unwin's, and that he planted it to mark a certain corner, we usually drop enquiry and go ahead; we use that stake. I have much pleasure in moving, seconded by Mr. Whitson, that the paper be received and printed in the Proceedings.

The President put the motion, which, on a vote having been taken, was declared carried.

Mr. Van Nostrand—If the report of the Committee on Repository and Biography is still open for discussion, I would move that it be taken as read and printed in the Proceedings.

The President put the motion, which was seconded by Mr. Esten, and on a vote being taken it was declared carried.

Mr. Van Nostrand—I understand this report will contain a suggestion that some of the biographical sketches which that committee has been collecting for many years—sketches of the older members of the profession in particular—be published in some form in our Proceedings. I would move that the Publication

Committee be authorized to publish a limited number of those sketches annually.

Mr. Esten—I second that motion. I think we have collected quite a few biographical sketches, and whenever I have written to the older members of the profession, and they have generally responded, they thought evidently that it was with the idea that the sketch should be published at once in the Proceedings. As a matter of fact, we have only made use of them as obituary notices, and it is not very pleasant for the committee to write for such sketches to the men themselves, and I think we ought to certainly publish some of them every year.

The President put the motion, which, on a vote having been taken, was declared carried.

The President called on Mr. Kirkpatrick to present the report of the Committee on Legislation.

Mr. Kirkpatrick—I could report verbally for the Committee on Legislation and put it in writing afterwards. Some time last December I wrote to all the members of the Legislative Committee and pointed out to them that now is a good time to let us know of any amendments that would be required to be made in the Survey Act, on account of the revision of the statutes. I only got two or three replies; none of the others have answered yet. Mr. Fitzgerald replied that he thought in the Registry Act there was a word which, if added, would improve the meaning of that particular section, which was to put the word “astronomic” before the word “course” in preparing plans for the Registry Office. Mr. Wilkie made a proposal, but unfortunately he is going to tell me what it is to-morrow; and Mr. Speight made a proposal that some definite explanation should be given as to what “proof lines,” in Section 26, were. I am sorry to say I have not been able to find out just what he wants. I thought the proof lines run in surveys meant that where the ends of the concessions are broken by a lake, that then the sidelines in that particular concession are to be run on the same course or parallel to the proof lines run in that concession; or if there were two proof lines, that the proof line nearest the end of the concession from which the lots are numbered should govern up to the next proof line, and that then the next proof line would govern up to the end of the township.

Mr. Van Nostrand—It is the order in which those lines come, as to when it is to be run at an angle on the front concession.

Mr. Kirkpatrick—As to whether you should take that extreme course of measuring the whole length of the concession and then running it on the angle given in the plan and field notes.

Mr. Van Nostrand—It seemed to me the statute is rather ambiguous as to which stage you enter the series of the different methods.

Mr. Kirkpatrick—In any case, I don't think the statutes will be all revised until after we meet again; and what I was going to suggest was that if any surveyor had any idea about any particular section or clause in the Survey Act that could be amended if he would let me know, I would consult through the Law Clerk with the judges and see what their views are in the matter. I mentioned here to some of you, I think, about Mr. Fitzgerald's idea of putting the word "astronomic" before the word "course," and some of you said it wouldn't do for some reason. I don't know myself about that, because I have not done anything under the Registry Act in the way of practising, and I don't know how that would come out, but some of you are working every day in the cities, and you would be able to understand that.

Then I might make a verbal report at the Council meeting. We passed a by-law at the last Council meeting, authorizing Mr. Henry J. Browne to be placed on the list of those who are not required to pay their annual fees, the reason being that Mr. Browne, as you all know, has not been practising regularly for a great many years. He is a sufferer from neuralgia, and he has been unable to do much work for a number of years, but he would like to retain his connection with the Association, and also he has been, I think, over 35 years in the practise of the profession. Of course it is not the policy of this Association to place everyone, as soon as they have served 35 years, on the retired list, whether they wish it or not, because there are many men who have had 35 years and who are just as well able to practise and pay their fees as anybody else. I suppose I would be entitled to, but I should not think of asking to be put on the retired list. Some surveyors think the moment they become eligible by 35 years they may cease to pay any fees to the Association. The intention was when the Act was passed that anyone who had been practising for 35 years before 1892 could, on paying the registration fee of the Association, become exempt from paying fees; that was in view of their long service as Provincial Land Surveyors; but I don't think it was intended to apply to every surveyor who has come in since. In case the Association gets very much larger, Mr. Russell has a proposal that all surveyors should be pensioned, and he would like this Association to take up the consideration of pensioning him, because he has had over 35 years, but I think the Association's funds are not yet in that flourishing condition that we can do so.

The President—Has any gentleman any remarks to make with reference to these reports?

Mr. Green—What I am about to say should have been, perhaps, asked in the Question Drawer, but it would come under the head of legislation. First, What protection, if any, has a surveyor with his party in the field? This is the first year I have had anything to do with surveying in Ontario. I had a gang of men and some of them under written contract and others under verbal contract, and witnessed at all times, they were to remain with me until the completion of the contract; half of them stayed till about half the contract was completed, and then they left; they call it down here, I believe, "jumped the job." Now, I was aware the thing was about to happen from the rumors—there is generally someone in the camp who will tell you what is going on—and I knew they expected to "jump" on a certain Monday. The day before, Sunday, a brother surveyor came along and I consulted him about the matter, as to what was the best thing for me to do; how to protect my property from the gang, and to prevent them from taking anything that didn't belong to them. I took his advice in the matter, because I was personally interested and perhaps my judgment might have been biased. Anyway, he decided that the best thing to do was simply to forbid them touching anything, and then if they did take anything, I would have a criminal action against them. They left, as I stated, on a certain Monday, and left me in pretty bad shape. I had forbidden them touching anything, but they took whatever they wanted. When I came out I went to a lawyer and asked him to take criminal action, and he advised me not to, for the simple reason that the case will go before a jury, and it was not likely we would get a conviction. Then the question comes up, what is the surveyor to do? Is he to protect his property with a gun? He apparently has no legal redress. If he has no redress when simply under a verbal contract, what is the best written contract? I would like to see the Committee on Legislation draw up, or get the Council to draw up, a form of contract something similar to what we have in the Dominion Act. There a surveyor has some protection. Of course we all know the labor organizations are very strong, and particularly strong compared with the Surveyors' Association. I didn't pay these men; I told them I wouldn't pay them. They got out and they went to a lawyer, and the first thing he did was to write to the Department. Now, this is a very disagreeable thing for any member of this Association; it casts more or less of a reflection on him to have the Department write to him and tell him they have received certain complaints

about his not paying his men. I would like to hear the views of the different members here, and to devise some means by which we may have protection. Of course during the summer weather the flies are perhaps the worst thing, but these men of mine all "jumped" just when winter was setting in, and it was almost impossible for me to get men again.

The President—I am afraid Mr. Green has opened up a wide question; when it comes to a question of contract and labor, it is one that comes under the ordinary laws. The question was quite fully discussed before, I think, in connection with a paper by Mr. Fitzgerald or someone. The question of contracts and as to whether there could be such a thing as a contract drawn up that would be binding, was discussed, and after looking at it from different points, I think it was concluded that it was not feasible. It is known pretty generally the position that the judges take in the courts with regard to laborers, in every case they decide the man must be paid, no matter what the conditions are.

Mr. Watson—I don't think there would be any remedy there.

Mr. Kirkpatrick—There has been a good deal of trouble of this kind in the last year with a great many survey parties, and while my sympathies are very strongly with the surveyors, I think they have probably the remedy in their own hands, and that is not to take out a gang of men that they know nothing at all about. If they can get the men that they can rely on and take out these men, the surveyors tell me they have no trouble. Others again pick up any man they can get, and they don't know whether he is accustomed to the woods or not. We have had several instances (and I don't know when the question is going to be settled, as it has gone on for two years now) in which the surveyor went up and just hired any men round about, and of course they wanted to go home and see their families every now and again! That was very nice for them, but what could the surveyor do? What he ought to have done was to have taken a gang of men up there from a distance, and he would have had them there and they couldn't go home because they had not the money. But if you go and put yourself in the hands of a lot of men living round where your work is, of course they want to go home occasionally. It is a very unfortunate thing for the Department, but how is the Department to adjudicate? It is not a thing they can adjudicate on at all; it will come to this, the surveyor will be sued, and I have not the slightest doubt, as you all know, that the judges will say, you pay the men; and the unfortunates will have to pay all these men perhaps a couple of thousand dollars—more than he gets for

the whole survey—because the township has taken six or eight months to survey. But I think really the surveyors have it in their own hands, and they will have to look out and take men they are acquainted with. If they can get the same men over and over again it is all right; but in any case, take men you can be sure will be good men in the bush; there is no use picking up men from the cities, they are no good when they get out into the woods.

Mr. Green—I am glad to hear Mr. Kirkpatrick take up the question, but I am rather disappointed to think that it is going to drop. You know that the surveyors in the Northwest have a certain protection which the law gives them. Am I to understand we can't get any protection in Ontario against labor organizations? I move the Legislative Committee enquire into the matter and find out whether we can get anything?

The President—I don't think the Government would legislate in favor of any class of employers; that would be class legislation.

Mr. Green—No, it is simply between master and servant.

Mr. Bolton—The only thing is to make an agreement with an employee that you will give him, say, a dollar a day, and if he remains with you you will give him 50 cents a day in addition.

Mr. Green—The two previous speakers tell me that won't do any good.

Mr. Van Nostrand—Use a sliding scale of wages, a minimum wage if they don't stay through and a bonus if they do.

Mr. Green—I didn't pay my men and they helped themselves to canoes and provisions and tents and went.

Mr. Watson—You can get redress when they take your property.

Mr. Green—The lawyer I consulted advised me not to take any action against them, because he didn't think a jury would convict them.

Mr. Watson—I think your lawyer was wise. I believe the Dominion Department do issue a form of contract, but I understand that won't hold in Ontario. There is no use making an agreement with them at all.

Mr. Green—I presume that a contract holds because there is a certain law governing it.

Mr. Watson—In the Dominion I believe there is.

Mr. Green—Why can't we get a law in Ontario so that a similar contract will hold here?

Mr. Watson—That was suggested last year, but I don't think you can do anything; as the President says, it is class legislation.

Mr. Green—I understand that there was a law covering the point some years ago which has been repealed.

Mr. Watson—You would have to put it on a military basis before you could control your men. I had men one season, and one of them had been with me for about five years; they were Indians; I got one blackguard in the bunch—they all hang together—and he took the whole bunch out!

Mr. Fitzgerald—I agree with Mr. Green, it is a pretty hard thing to put up with, but I don't think there is any remedy.

Mr. Low—There was a case in Sudbury where the surveyor's men "jumped"; they left and took what they wanted, and they broke a canoe; the surveyor let them go ahead and sue for wages; the judge granted their wages, but made them pay for the canoe and anything else they took.

Mr. Green—I wouldn't call that very fair treatment myself. This particular case Mr. Low has quoted—I don't suppose there is any secret about it—everyone knows Mr. Bird very well; it was his gang; he was next above me, and I remember the party distinctly starting out, and it was the lawyer that handled his case that is handling my case now. Mr. Bird tells me that the judge allowed them for all the time they were there, and only deducted from their wages the taking of the boat and the destruction of the property.

Mr. Code—I have never had very much trouble with my men, and I am surprised that other surveyors should have so much trouble. It may be some advantage to know my system. I generally get a man in the locality, or as near the survey as I can, to look out some months ahead for a gang for me, and I pay the man for picking up the men and any trouble he goes to, and I simply tell him to make the agreement with the men that they are to stay the time required; and that time probably will be three or four months, or whatever time the survey is expected to last. After you get the men, talk with each one of them personally; make a verbal agreement (a verbal agreement is better 100 times than a written agreement, because it covers everything), that the men are to stay, and if they are reasonable, come home with you when your contract is done. Of course some of those men are naturally "jumpers." No man can go into a new territory and pick out good men himself; he must have somebody who knows all these people, to employ men for him, and his services are well

worth the small amount of money it costs. Of course those "jumpers" probably will never give you the reason why they "jump." I have only had about two men "jump" in my five or six years experience, and I guess they "jumped" by mutual consent between them and myself. I have had very little trouble so far with men.

Mr. Dunn—I am very sorry to hear that it is impossible to make or draw a contract so that men can be bound by it. I remember well the circumstance that Mr. Green has spoken of, and I thought at the time if Mr. Green would have to pay the large party that was going out, he certainly would find it a very considerable hardship to put up all of their wages and have to look for other men to take their places. I had only two men "jump" last summer, and I guess I am about to be sued for the pay of those two men, and from what I have heard now, I suppose I will have to pay it. I didn't think I would have to. I had written contracts with all of my men. I can't see how a verbal contract would be of any use, because I can't understand how you could prove the contract. You are one person and the men that you have with you are probably 16 or 18, and they would rather have the best of you if it came to a show down. I, of course, have not much experience in the line you speak of, but I mention these matters because Mr. Green mentioned my name, and I shall be interested in hearing the result of Mr. Green's trouble.

Mr. James—Do I understand that the sliding scale works well?

Mr. Low—We have found it works very well. We have had survey parties out, and the men "jump" and leave us with five or six days wet weather, and we cut out every hour we can, legally, and we give them the dirty end of the stick, so to speak. We find that works very satisfactorily. When they find we are going to give them as little as we can, they will stay on.

The President—My experience with regard to contracts supplied by the Dominion Government is this, I never saw a good man yet, or a man who I would want on a survey, who would sign one of those contracts. I have had a good deal of experience, especially in the Northwest; about 30 years ago, I think, I commenced to make surveys out there.

Mr. Dunn—I think when a man is hired by the month his pay becomes due at the end of the month. But could you hire a man for four months for, say, \$200, and have an arrangement that the only way he could collect it would be by staying the four months? I understand you couldn't hire him to the end of the work, because he wouldn't know when the end of the work would be.

The President—I think you can hire him and not pay him till the end of the four months, but you will have to pay him for all the time he works, even if he leaves you.

Mr. Green—It is a legal question, but I move that the matter be referred to the Legislative Committee and let them get legal advice on the matter, and if a form of contract can be drawn which will be of any benefit to the surveyor or the members of this Association, let them formulate one.

Mr. Kirkpatrick—Wouldn't it be better, instead of referring it to the Legislative Committee, to refer it to the legal adviser of the Association, and get his views on it? That is, Mr. Armour, and if he can devise any means and give us a report on it I think the money would be well spent.

The President—Would you like to change your motion, Mr. Green, and submit this question to the legal adviser?

Mr. Green—Yes.

Mr. Code—I second the motion.

The President put the motion to a vote, and the same was carried.

Mr. Green—The other question is a question of bearings. In commenting on Mr. McMullen's paper, Mr. James spoke about his system of keeping traverse notes, or at least the bearings. I followed that system also for a great number of years, that is, doing away with bearings so far as north, south, east and west are concerned, and reading your instrument; where there is a double reading, just read the outside circle, which reads from 0° to 360° . You read the azimuth, as it were, and let the azimuth refer from 0° to 360° around by the right, like a watch, 90° , 180° , 360° from 0° . What I would like to know to begin with is, would the Department here accept returns with the azimuth, reading in that way round? I presume they would not. Every surveyor, I presume, who makes any extensive traverse, adopts that system. It eliminates a great many chances of error, because when you write north-east or south-west or any of these letters, you are liable to error. When you follow the system of the azimuth from 0° around to 270° and 360° , as contained in the B. L. S., you eliminate that error altogether, because everyone knows if you read your vernier 140° , where that is pointing towards there is no chance of error. It is just as clear to a surveyor, to my mind, as south 40° east, and as I say, it eliminates all chances of error in taking down the field notes. I presume that the Department here wouldn't accept returns that way.

I would move that steps be taken by which the Department be asked to accept returns given in that way, and that in the system of survey of Ontario some amendment should be made to that effect. I would like to hear someone else's views on this.

Mr. Bolton—I would hardly think that would be necessary. For my part, in making traverse I would use that, but it is an easy matter to change it to the bearings to suit the Department.

Mr. Green—It is easily done, but it is unnecessary.

Mr. Bolton—Well, it would be considerable trouble to the Department to change their method.

Mr. Kirkpatrick—We have never had them returned that way. The only real, practical difficulty that I see is that it would simply give Mr. Whitson and myself a good deal more trouble; we would have to do it ourselves. We couldn't hand over the examination to anybody else, while you all know we are pushed hard to do the work at all. We try to get the examination done as soon as possible. I don't know that we could teach men who are not surveyors that kind of thing. It is a very difficult thing to do to explain all the ins and outs of those things. I think it is quite easy for surveyors to do it. And then we have the old-fashioned custom. I could do it myself, but I haven't got time to examine every return. I do the best I can by looking over them after the errors are pointed out to me to see what they are.

The President—It is only a matter of a minute or two to show the bearing in the ordinary way to suit the Department. For my own part, I always adopt that means of reading my bearings around to 360° and also in plotting.

Mr. James—Wouldn't it be just as handy in our Registry Office to have it done by azimuth all through? The letters are of no significance to lawyers that I know of; they are just like Greek letters to them; they don't know exactly what they mean. If we had an understanding to make our returns to the Registry Office in this way it would be a start.

The President—In a paper two years ago, I think I tried to set forth the simplicity and advantage of making the traverse notes in this way, and it was discussed pretty fully.

5.15 p.m. the meeting adjourned to Thursday, February 27th, at 10 o'clock a.m.

MORNING SESSION, THURSDAY, FEBRUARY 27TH, 1908, 10.30 A.M.

The President called the meeting to order, and asked for the report of the Auditors as the first order of business.

The Secretary—I have already read my report and presented it to the Auditors. They have gone over the accounts and have certified as follows: "We hereby certify that we have examined the Secretary-Treasurer's vouchers, receipts, financial statement, and bank account, and find them correct. February 26th, 1908. Lewis Bolton, W. A. McLean, Auditors."

There being no discussion on the subject, the President declared the Auditors' report adopted.

The President called for the report of the Committee on Polar Research.

The Secretary—Mr. Chipman will put in a report for publication.

It was moved by Mr. Rorke, and seconded by Mr. Bolton, that the report be taken as read and printed in the Report.

The President declared the motion carried.

The President called for the report of the Committee on Entertainment.

The Secretary—I am sorry to say we were so late last evening I have not yet had time to prepare the report, but it seems from the accounts I have received, from most of the members present, that the entertainment was fairly satisfactory. I will write out the details, with the names of those present, so that it may be printed in our Report. I regret that we will not be able to include some of the able speeches that were delivered.

The President—The report will be taken as read and printed in the Report.

The President called for the report of the Committee on Engineering.

The Secretary—I understand Mr. Davis is not able to be here. I will write him to send his report for publication.

The President called for the report of the Council of Management.

The Secretary—I understand the report is not yet ready.

The President called for the report of the Committee on Publication.

The report was read by the Secretary.

It was moved by Mr. Rorke, seconded by Mr. MacKay, that the report be received and adopted.

The President declared the motion carried.

The President called on Mr. Selby to give his paper, entitled, "The Peace River District."

Mr. Selby—Mr. President, the object of this paper is not so much to extol the beauties and magnificence of that great country which we hear so much about in the papers, as it is to give you a more faithful description of it and a fair idea of what may be expected of it in the future.

The President—Papers like this of Mr. Selby's are of incalculable value to us, because they bring reliable information of parts of the country of which little is known. When we come to realize that this country which Mr. Selby has been telling us about lies eight hundred miles north of the latitude of Toronto, and about three thousand miles west, we can form some idea of the vast extent of our country. The paper is valuable because it is based on facts which we, as land surveyors, can depend upon, not on a cursory examination. For several years Mr. Selby has been making surveys in that country, and he knows what he is talking about. The paper is not only valuable to us, but valuable to the country at large and valuable to the Government and to all who desire information about our country. I am sure we all feel very grateful to Mr. Selby for the trouble he has taken in compiling this paper for our Report.

Mr. Kirkpatrick—I was very much interested in the splendid paper which we have just heard. I certainly think the thanks of this Association are due to Mr. Selby. Now, we can hardly realize the extent of the country that he has been describing to us. It seems to be immense. I have two sons in Edmonton, and it was only the other day I received a letter from one of them, describing a speech that was made at a dinner given by the Speaker of the Assembly to the Edmonton people. They were talking about buying seed wheat, and I think it was the Speaker himself said that one member of the Legislative Assembly had six thousand bushels of the finest wheat in the world, grown on his farm at Peace River, and that it would be for sale. They went on to explain the marvellous extent of the agricultural territory up there. He tells me that Edmonton has a population of nineteen thousand now, and when my son went there in 1889 there was a population of 650, so I suppose he is one of the oldest residents now. It was only yesterday I got quite a large photograph of the bank of which he

is the manager, and I was surprised—there is scarcely a bank in Montreal or Toronto like it. There were four magnificent pillars of stone in front of a four-storey building, on a corner, and it looked very fine indeed. It is a perfect marvel. It shows what wonderful things are going on there under our eyes, and I am not surprised that young men say, well, we will go west. We all get the fever. I had not exactly the fever, but I went out there four or five years ago, and I drove out to Athabasca Landing, and I remember driving through a lot of poplar trees. The poplar trees were of the original forest, not the scrubby little things you see sometimes. I suppose they were between two and one-half and three feet thick, and just as good poplar as you would see anywhere. Of course it takes a long time to clear that ground, but there is the wood, and it shows what the country will produce. When you get to Athabasca Landing you think you are at the world's end, but they will have a Roman Catholic cathedral there which is to cost \$100,000. I don't suppose it is finished yet, but the foundation walls were built, stone walls about ten or twelve feet thick. And, after all, that was only a jumping-off place, because you are four or five hundred miles from the Peace River, so there is no end to the possibilities there. We see a lot in articles about the last West, and I don't know that we should be so anxious to get rid of the last West. Some of us have got children and grandchildren, and we don't want to see it filled up this year or next year. My idea is we should go at it slowly and not introduce all the nations of the world up there, but try and make it a British Canadian country, so that the majority of the settlers will be of our own origin, so that we can make it a God-fearing country, and not introduce a whole lot of other people who will take a long time to assimilate. Of course they would ultimately assimilate, just as our friends the Doukhobors are doing. They are turning out first-class settlers because they are becoming Canadianized. I suppose you remember reading of the fifty or sixty of them who started to walk naked through the streets of Fort William when it was twenty degrees below zero, but they were promptly caged. They will eventually become good settlers, and we welcome them all!

I have much pleasure in moving a vote of thanks to Mr. Selby for his interesting paper.

Mr. Bolton—I have much pleasure in seconding the motion. Carried. (Applause).

The President—I have a communication from Haileybury, asking about surveys of lots. It is signed by James H. Smith, Robert Laird, and H. T. Routley.

That, I suppose, would be a question that would come before the Committee on Land Surveying.

It was moved by Mr. Bolton, seconded by T. D. Green, that the communication be laid before the Committee on Land Surveying.

The President put the motion, which on a vote being taken, was declared carried.

The President—There are several reports which the Committee on Publication will have to have authority to publish, as these reports have not been read before the Association. The first one is the report on Engineering, then the report on Polar Research, and the report of the Council of Management.

Mr. Hutcheon—I move that the report on Engineering, the report on Polar Research, and the report of the Council of Management be taken as read, and printed in the Report.

Mr. E. D. Bolton—I second the motion.

The President put the motion, which, on a vote having been taken, was declared carried.

The President—It is moved by Captain Gamble, seconded by Mr. Van Nostrand, that any errors or omissions in the record of the proceedings of this meeting now in the hands of the Secretary and the Reporter be corrected by the Committee on Publication before the printing of the annual report.

On a vote having been taken, the motion was declared carried.

Mr. Kirkpatrick—I would like to move that a resolution of condolence be sent to the relatives of our deceased brethren.

Two of these, you remember, were killed, if not three. Mr. Macdonald met his death by a runaway, and Mr. Davis stepped off a train and caught his foot; it had to be cut off, and he died from blood poisoning.

The President put the motion, which on a vote having been taken, was declared carried.

It was moved by Mr. Rorke, seconded by Mr. Newman, that the sum of \$300 be handed to the Secretary for his services during the past year. Carried.

It was moved by Mr. P. S. Gibson, seconded by Mr. Van Nostrand, that the Committee on Legislation be requested to consider the contents of the paper by Mr. S. Bray, entitled, "City and Town Lots," before forwarding the suggested changes in the statutes to the Revising Committee of the Legislature.

Mr. Wilkie—I heard parts of Mr. Bray's paper read yesterday, and as a member of the Committee on Legislation it doesn't appear to me there is anything in that paper which would make it necessary for the committee to deal with it. The paper is in reference to sub-divisions of town lots, and apparently he wishes to have them made some particular size. It appears to me that is not a matter that this Association could request legislation upon. He also deals with the matter of high buildings on streets affecting the light. I don't see that we have anything at all to do with that. Of course I would like to study the paper closely, and possibly I might find something to be dealt with by the Committee on Legislation.

Mr. P. S. Gibson—He wishes the Legislature to authorize the municipal councils and officials to see that lots are laid out of sufficient depth, the same jurisdiction as they have with reference to the width of roads. There can be no harm in it anyway. As to the height of buildings, I suppose you are right.

Mr. Van Nostrand—The purpose of that motion was to draw the attention of the Legislative Committee to the contents of the paper, and let them deal with it. It seemed to me, in hearing the paper read, it was a step in the right direction. We have already found it in the public interest that the municipality should have the power to regulate the depth of the lots, because it is well known there are a great many eyesores in the towns and cities by reason of the insufficient depth of lots. The depth of these lots becomes fixed where they have streets upon each side, and they remain so for all time unless some very radical changes are made in the position of streets already existing. If the Committee on Legislation see fit to suggest to the Revising Committee of the House that this power be given to municipalities, that is to say, that the Registry Act be so amended that the Registrar will not receive a plan with lots less than the minimum depth, without the consent of the municipality, no particular harm could be done anyone, and much good might result to the public, and that good will extend away into the future long after we are gone.

Mr. MacKay—I heartily agree with what Mr. Van Nostrand has said. We know the Registry Act at the present time regulates the widths of the streets—at least, the municipality has control and can sanction the laying out of the streets at certain widths. Yet they have no control or power to regulate the depth of the lots. It often happens, I have found in my practice, that parties submit a plan of a sub-division where the lots are very narrow. Sometimes the municipality will not consent to the laying out of a narrow street, and simply cut down the depth of the lot and

make the street 66 feet. In the case in question the municipality has no control over the sub-division whatever, whereas if both streets and lots were under the control of the municipality they could be dealt with.

The President put the motion, which, on a vote having been taken, was declared carried.

It was moved by Mr. A. T. Ward, seconded by J. J. Mackay, that the sum of five dollars be granted to each of the Auditors for their services in connection with auditing the accounts of the Association for the past year.

The President put the motion, which, on a vote having been taken, was declared carried.

The President called for nominations of officers for the ensuing year.

ELECTION OF OFFICERS.

Mr. P. S. Gibson—I nominate Mr. Van Nostrand for President.

The President—There being no other nominations, I declare Mr. Van Nostrand elected President for the coming year. (Applause).

Mr. Van Nostrand—I thank you for the honor. It is a responsibility that I rather shirk, but I feel at the same time it is the way out of trouble, because, having once put in twelve months in the position of President, one is given a long holiday, and that I can now look forward to.

The President—The next nomination is that of Vice-President.

Mr. Lewis Bolton was nominated as Vice-President.

The President—There being no other nominations, I declare Mr. Bolton elected Vice-President.

The President called for nominations for the office of Secretary-Treasurer.

Mr. Selby—I nominate Captain Killaly Gamble as Secretary-Treasurer. I am sure he has filled the position well in the past.

The President—There being no other nominations, I declare Captain Gamble elected Secretary-Treasurer.

Captain Killaly Gamble—I again have to thank you for the honor you have done me and the confidence you have reposed in me in appointing me Secretary for another year. I shall do all I can to further the interests of the Association. I feel my fail-

ures very often, and I know there are many others who could fill the office better than I can; but I always have the interests of the Association at heart, and will do the best I can. (Applause).

The President—I understand that the present Auditors do not wish to be re-appointed, so I must call for nominations for Auditors.

Mr. Rorke—I nominate Mr. J. J. MacKay and Mr. A. T. Ward as Auditors for the coming year.

Mr. Van Nostrand—I second the nomination.

The President—There being no other nominations, I declare Mr. MacKay and Mr. Ward elected Auditors.

Mr. MacKay—Mr. President, I am sure it is quite unexpected on the part of Mr. Ward and myself to be appointed to the position of Auditors. This is certainly a new duty for us, but we will do our best to see that Captain Gamble keeps his books straight.

Mr. Ward—Mr. MacKay has said all that was necessary on behalf of us both. I hope that the Secretary will keep his books in such shape that the present Auditors will not feel like retiring at the end of the season. (Laughter).

The President called for nominations for two members of the Council to fill the vacancies caused by the retirement of Mr. Kirkpatrick and Mr. Whitson.

Mr. P. S. Gibson—I nominate Mr. Kirkpatrick.

Mr. Kirkpatrick—I nominate Mr. Hutcheon.

Mr. Van Nostrand—I nominate Mr. Wilkie.

Mr. Ward—I nominate Mr. Selby.

Mr. Wilkie—I nominate Mr. Whitson.

Mr. Kirkpatrick—I nominate Mr. Fitzgerald.

Mr. Rorke—I nominate Mr. E. D. Bolton.

With the permission of Mr. Rorke, Mr. Bolton withdraws his name.

The President declared the nominations closed, and appointed Mr. Esten and Mr. W. McLean Scrutineers.

The President called for any unfinished business. (No unfinished business).

The President called for any new business. (No new business).

Mr. Kirkpatrick—I move that Mr. Fawcett leave the chair, and that Mr. P. S. Gibson take the chair.

Mr. P. S. Gibson takes the chair.

Mr. Kirkpatrick—Now I have the pleasant duty, but in one sense it is not a pleasant duty; but we know that things have to change, we have to appoint new Presidents; in the old days they said, "The King is dead, long live the King." So in the present instance, the President having vacated his office, it becomes us to give him a hearty vote of thanks for his great courtesy and the skill with which he has filled the office of President. It is a very great honor, I consider, to be the President of the Ontario Land Surveyors' Association. I know I felt it a great honor when I was President. I think we should stand up and give a vote of thanks to Mr. Fawcett for the way he has conducted the business in his year of office as President of the Association of Ontario Land Surveyors.

Mr. Wilkie—I have pleasure in seconding the motion.

Mr. Gibson put the motion, and the members standing up, gave a vote of thanks to Mr. Fawcett. (Applause).

Mr. Fawcett—Gentlemen, I appreciate very much your kindness, and thank you for your kind words. I have esteemed it a great honor to be the President of this Association, for I think our Association embodies some of the best and the ablest men in the Dominion, and to take charge of their proceedings or to hold a high office in such a body of men, I consider a privilege of which anyone might be proud. I thank you for the hearty way in which you responded to the motion.

All that remains now is to declare the meeting closed until next year. We hope all present will be permitted to come again together, with many who are not at this meeting. We know Mr. Van Nostrand, who has done so much for the Association in the past, will look well after it during this coming year.

PRESIDENT'S ADDRESS.

To the members of the Association of Ontario Land Surveyors:

Gentlemen,—I have great pleasure in bidding you welcome to this, the sixteenth Annual Meeting since the incorporation of our Society as the "Association of Ontario Land Surveyors." In reviewing the past year we have abundant reason for gratitude to the great Architect and Governor of the universe for continued peace and prosperity. The past year has been one of success and profit for the majority of the members of our Association, many of whom are unable, because of the urgency of their work, to attend the Annual Meeting even at this time of the year, when the demand for surveys and engineering work is not so great as during other parts of the year. For those who during the past season were engaged on Government, mineral and other surveys in the wilds of our own Province, the difficulties were by no means trivial, conditions arising which at times were very discouraging, excessive rains, dissatisfied and unreasonable employers, broken agreements, and desertions from the party, at times when great injury and loss would be the outcome, all have a tendency to place the surveyor on the anxious seat; but victory over such obstacles brings a feeling of satisfaction not otherwise experienced once the task is accomplished. We trust that the change in industrial conditions which has recently overtaken our country, in common with that of other nations, will not prove to be an unmitigated evil, but that those most affected will become more reasonable in their demands and take some little interest in the welfare of those they are employed to assist. Those who attended our last Annual Meeting, or who have read the Annual Report of that meeting, have knowledge of the several memorials submitted on that occasion: One to the Hon. the Minister of Lands, Forests and Mines, setting forth the necessity of increasing the remuneration for the work undertaken by the surveyor, both under contract, and salary, due to the increased cost of labor, supplies, and camp equipage. The majority, if not all of you, have learned that the memorial not only received consideration from the Department, but the recommendations set forth in the memorial were adopted with one single exception, thus proving the readiness of the Ministers of the Crown to remedy any defects in the Departmental economy brought to their attention. I am sure we do not fail as an Association deeply interested in this matter, to appreciate this immediate response to our request on the part of the Honorable Minister, and also the support of the Director of Surveys and the Deputy Minister, who are so closely in touch with the survey work that they could appreciate the justice of the request and bring the matter more

fully before the Minister than we could set forth in a memorial. Another memorial to the Right Hon. Sir Wilfrid Laurier, Premier of Canada, set forth the urgent necessity of undertaking a geodetic and trigonometrical survey of the Dominion, and that the primary work should be undertaken by the Federal Government at an early date. The reply to the memorial in a letter from the Hon. Frank Oliver, Minister of the Interior, stated that the question had been carefully considered by a departmental conference convened at the instance of the Minister of Militia and Defence, and that the conference had submitted a report now before the Government. This reply bore date of 26th March, 1907. Preliminary work towards such an undertaking has been carried on to a limited extent by the astronomical branch of the Department of the Interior, we have been informed by our former President, Dr. Klotz; but much greater activity towards this important work will have to be displayed before any benefit be derived by the Provinces. If the work was fairly started and points in the primary triangulation permanently marked, I am confident that the progressive Provincial Governments would lose no time in carrying on the work to completion by arranging for the secondary triangulation, leveling and establishing permanent marks on the ground, and sectional maps on such a scale that they may be of utility to surveyors, engineers, municipalities, joint stock and insurance companies, and in all public works, supplying information which at present is only obtained through expensive preliminary and exploratory surveys which are indispensable in all road construction, railways and other roads, waterways and irrigation ditches, drainage, and all similar undertakings, before any estimate of the cost or idea of the best locations can be formed. Such maps as are constructed in connection with a completed geodetic survey would take the place of these preliminary and exploratory surveys, so that roads could be located, schemes for municipal drainage adopted, and a close estimate of the cost of all such undertakings arrived at, by competent persons, from the simple examination of the maps. A question of more than passing interest to our Association has arisen through recent legislation by the Dominion Parliament amending, or rather changing, the Act in regard to the qualification of Dominion Land Surveyor, the new Act providing that surveyors in certain of His Majesty's dominions, other than Canada, may become qualified as Dominion Land Surveyors without passing any examination except that portion of the Dominion Lands Act relating to the survey and division of lands, and the manual of survey issued by the Surveyor-General of the Dominion for the guidance of surveyors employed in the survey of Dominion Lands. When the Dominion Lands Act came into operation in 1872, all the surveyors who at that time were qualified to make surveys in any of the Provinces which constituted the Do-

minion at that date, were named *ex officio* Dominion Land Surveyors; all subsequent Dominion Land Surveyors became such by passing the prescribed examination for such qualification. Since that date the standard of the examinations has gradually been raised, both for Dominion and Provincial surveyors, in most of the Provinces, so that a standard fairly uniform in the ordinary mathematical subjects entering into the examination given by the several Provinces and the Dominion, has been adopted in so far as the examinations are similar. For a time there was reciprocity between the Dominion and Provincial Boards, so that examinations in those subjects which covered the same ground were accepted by the several boards of examiners; and those who had passed full examinations before the one board were not re-examined in the same subjects by the other. After a short trial, this arrangement came to an end, and surveyors from the Provinces were required to pass the full examination before the Dominion Board of Examiners to become qualified to survey Dominion lands, and those who had passed the Dominion Board had to pass the full examination before the Provincial Boards before they became qualified to make surveys in the Provinces. There was no particular hardship or grievance in this, as the candidates usually presented themselves for the two examinations while the subjects were still fresh in their minds; and the examining boards had the right to terminate the reciprocal arrangement if they considered the examinations were not similar in their requirements, and so long as all were admitted on the same terms. Truly there are several subjects relating to engineering and surveying prescribed in the Revised Statutes of Ontario, in which candidates for the Ontario examination are examined that are not included in the list of subjects for D. L. S.; and the several Acts are entirely different, thus necessitating separate examinations in these particular subjects; but the new Dominion Act, while it purports to re-establish the reciprocal status to a certain degree, states in a foot note that these advantages will only apply to sister colonies, such as Australia, New Zealand, Cape Colony, etc., "where the standard of the examinations is very high." We do not believe that the standard of examinations for land surveyors is higher in any country than it is in the Provinces of Canada, and especially in the Province of Ontario, where three-fourths, at least, of the candidates who come before the board for examination are university graduates, and those who are not have to acquire an education in many respects equivalent to that obtained by the university graduates. It seems reversing the order of affairs when emigrants from foreign countries are granted privileges not accessible to the loyal citizens of Canada. That there was any necessity for such a change in the Act we do not believe. There certainly is no

scarcity of surveyors, any more than a scarcity of doctors or lawyers, that they should have to be imported from foreign countries and constituted such by Act of Parliament. Few of us had heard anything about the change until it had passed through the Commons and became law. The Board of Examiners have some discretion in the matter, and as all the gentlemen on the present Dominion Board of Examiners are men who stand at the very top of the profession educationally, they will undoubtedly use that discretion in debarring any from qualifying who do not possess the mental equipment necessary for the work. I regret to have to report the death of six of our active members since last Annual Meeting, viz.: Messrs. Augustine McDonell, Chatham, Ont.; Milton C. Schofield, Guelph, Ont.; John McLatchie, of Nelson, B.C.; John Davis, of Alton, Ont.; R. H. Squire, of Brantford, Ont., and E. C. Steele, of Sault Ste. Marie, Ont. With five of the gentlemen I had little personal acquaintance, but with Mr. McLatchie I had a close personal acquaintance, as we often met in the Northwest in the early history of that country, and in Ottawa, where we both resided before he went to the western Province to make his home. I knew him to be one of the most careful, painstaking surveyors I ever met, a man who could carry in his memory landmarks and topography of places he had not seen for many years. He was one of those men who could endure all things, with an unlimited supply of energy and strength, and a constitution of iron; he could pass through hardships with an ease possessed by few men. All these gentlemen had served their country for a good many years, except Mr. Squire, who was one of the younger members of the profession. Mr. Schofield had been under commission upwards of sixty-four years. These departed remind us that we shall pass away sooner or later, and if we wish to merit the "well done" when we shall have planted our last landmark, we will guard well the principles lying at the base of our profession, "justice to all and favors to none," that we will each do our work "without favor, affection, or partiality," as required by our oath of office.

You will be pleased to learn that our finances are in a flourishing condition, and we have before us an interesting programme consisting of papers and reports from the various committees, which will provide abundant matter for discussion. The Chairman of the Committee on Polar Research, Mr. Chipman, assisted by the Council, has provided a treat for us this evening in Massey Hall, where we can become acquainted with the celebrated polar explorer, Commander Peary, and listen to the interesting narrative relating to his work in that great unknown region.

Reports.

SECRETARY-TREASURER'S REPORT.

Mr. Chairman,—I have the honor to submit my report of the official business of the Association transacted by me between the 26th February, 1907, and the 25th February, 1908. Early in the year, with the assistance of the Publication Committee, I revised the minutes of our Annual Meeting and prepared for publication the "papers" that had been read at that meeting.

We sent copies of our Reports to the following societies:

School of Practical Science, Engineering Society.....	100 copies.
Michigan Engineering Society.....	130 copies.
Ohio Society of Surveyors and Civil Engineers.....	100 copies.
Illinois Society of Engineers and Surveyors.....	150 copies.
Indiana Engineers' Society.....	130 copies.
Iowa Civil Engineers' and Surveyors' Society.....	115 copies.

And copies of their Reports were sent to all our members who were not in arrears with the Association.

During the year 11 new members have been added to our list, three active members have withdrawn their names from the list of practitioners, and death has removed Messrs. E. C. Steele, John Davis, John McLatchie, R. H. Squire, Augustine McDonell, and also Milton C. Schofield, the oldest member of the profession, he having been admitted to practice 28th September, 1843.

There is much room for improvement in our Department of Repository and Biography.

Our thanks are due to the various departments through whom we have regularly received the Annual Reports of the United States Coast and Geodetic Survey, the Geological Survey of Canada, the Dominion Archives, and the Ontario reports of the Bureau of Mines, and the Bureaus of Industry and Forestry.

The financial statement accompanying this report shows the prosperous condition of the Association.

I must again, in conclusion, express my gratitude to the members of the Association for their support and for the assistance many of them have given me in carrying out my duties.

**STATEMENT OF BALANCES, RECEIPTS AND EXPENDI-
TURES BETWEEN THE 26th FEBRUARY, 1907,
AND THE 25th FEBRUARY, 1908.**

Dr.

To Balance in Savings Account 26th February, 1907...	\$2,192 60
“ Balance in Current Account 26th February, 1907...	213 65
“ Receipts in Board of Examiners' account, including Government grant of \$200 and regular fees....	952 00
“ Annual fees, including Associate fees.....	979 09
“ Amount collected from advertisements.....	63 00
“ Accrued interest in Savings Account.....	75 60
	<hr/>
	\$4,475 94

Cr.

By Amount for publishing Proceedings, 1907-8.....	\$ 427 75
“ Amount granted to Secretary-Treasurer.....	275 00
“ Amount paid for postage.....	97 20
“ Amount, printing and stationery	26 85
“ Stenographer's fees reporting the Annual Meeting..	50 00
“ Amount granted to Auditors.....	10 00
“ Freight, express, bank exchange, customs, brokerage and sundries	11 58
“ Assurance on Secretary's Bond.....	7 50
“ Armour and Mickle	6 91
“ Caretaker of Repository	10 00
	<hr/>
	\$922 79
By Amount of disbursements in Board of Exam. Acct. \$	336 70
“ Balance in Savings Account.....	1,993 20
“ Balance in Current Account.....	1,223 25
	<hr/>
	\$4,475 94

Respectfully submitted, -

KILLALY GAMBLE,
Secretary-Treasurer.

REPORT OF THE COUNCIL OF MANAGEMENT FOR THE YEAR 1907.

The Council begs to report to the Association of Ontario Land Surveyors that it has held two meetings since the last meeting of the Association—one on the 16th April, 1907, and the other on February 25th, 1908.

At the meeting of the 16th April, 1907, Mr. George B. Kirkpatrick was appointed Chairman of Council for the ensuing year.

At the meeting of the 16th April, 1907, the several Standing and Special Committees required by the statute, by-laws and resolution of the Council, were appointed, also naming the Chairman of each Committee.

At the meeting of February 25th, 1908, the Council passed By-law No. , to exempt from dues Harry John Browne, of Toronto. The by-law is as follows:

Whereas it has been proven to the satisfaction of the Council that Harry John Browne was granted a commission as a Provincial Land Surveyor on the 16th July, 1872, and that the said Harry John Browne has been for several years a great sufferer from illness and is practically unable to practice his profession, it is therefore enacted that the said Harry John Browne is hereby granted exemption from dues under the authority of sub-section 4 of section 42, chapter 180, Revised Statutes of Ontario, 1897.

During the year Azimuth Tables have been prepared by Mr. Frank L. Blake, as authorized by the Association, and have been distributed to the different members; also copies of the Ontario Land Surveyor's Minimum Tariff.

The Council has to regret the loss of six members of the Association by death since the last meeting, namely, Augustine McDonell, of Chatham; Milton C. Schofield, of Guelph; Edward Charles Steele, of Sault Ste. Marie; John Davis, of Alton; John McLatchie, of Nelson, B.C., and Richard Herbert Squire, of Brantford.

Respectfully submitted,

GEO. B. KIRKPATRICK,

Chairman of Council.

REPORT OF COMMITTEE ON PUBLICATION.

Mr. President,—We commenced business soon after the striking of the Committees by the Council at their April meeting. The publication of the Annual Report was entrusted to the Stevenson Printing Co., and was carried out promptly and satisfactorily, after the necessary material was placed in their hands.

The usual number of 1,350 copies was printed, at a cost of \$427.75, and distributed amongst our exchanges and members.

A set of examination papers was printed in the Report.

We regret that our revenue from advertisements has fallen off latterly, and we would respectfully suggest that the Secretary be authorized to place this department in the hands of a professional agent.

Respectfully submitted,

KILLALY GAMBLE,

Chairman.

REPORT OF BOARD OF EXAMINERS OF ONTARIO LAND
SURVEYORS, 1907-8.

The Board met in the Board Room, Department of Lands, Forests and Mines, on Monday, the 10th February, 1908.

The following candidates passed the required Preliminary Examination:—

Edward Fitzgerald,
George Leumas Flint,
Percival Anthony Jackson,
Lloyd de Loss Barber,
Kenneth Loudon Jardine.

The following candidates passed the required Final Examination:—

Arthur Gowan Ardagh, Barrie, Ont.
Gordon Foster Summers, Toronto, Ont.
Frederick William Paulin, Toronto, Ont.
Clayton Elgin Bush, Toronto, Ont.
Homer Wilson Sutcliffe, New Liskeard.
William James Moore, Pembroke.
John Leiper Lang, Sudbury.

Messrs. A. G. Ardagh and William J. Moore were duly sworn in on February 18th.

Messrs. Summers, Paulin, Bush, Sutcliffe and Lang to present themselves for the purpose of being sworn in at a later date.

The following articles were filed by the undernamed pupils during the year:—

PUPIL.	SURVEYOR.	RESIDENCE	DATE	TERM
Jones, G.S.	Moore, J. H.	Smith's Falls..	1st. Feb., 1907. ...	1 year.
Ricketts, D.C.W...	Gillon, D. J.	Fort Frances..	11th Feb., 1907 ...	3 years.
Browne, W. H. ...	Browne, W. A.	Toronto	15th Feb., 1907 ...	3 years.
Lee, M. R.	MacKay, J. J.	Hamilton	16th Feb., 1907 ...	3 years.
Anderson, H.M....	Shaw, J.	North Bay	16th Mar., 1907....	3 years.
Coltham, J. T....	Beatty, H. J.	Eganville	17th Mar., 1907....	3 years.
Patterson, F. E....	DeMorest & Stull	Sturgeon Falls	25th Mar., 1907 ..	1 year.
Moore, W. J.	Morris, J. L.	Pembroke	5th April, 1907 ...	1 year.
Code, R. W.	Code, A. S.	Alvinston	1st May, 1907	3 years.
Paulin, F. W.	Wells, A. F.	Sandwich	1st May, 1907	1 year.
Lang, J. L.	DeMorest & Stull	Sudbury	1st May 1907	1 year.
Sutcliffe, H. W.	Smith, J. H.	New Liskeard..	10th May, 1907 ...	1 year.
Summers, G. F....	Fullerton, C. H....	New Liskeard..	10th May, 1907 ...	1 year.
Bush, C. E.	Galbraith, W.	Bracebridge	11th May, 1907....	1 year.
Stiles, J. A.	Moore, J. MacK.	London	8th July, 1907 ...	1 year.
Chase, A. V.	Moore, J. H.	Smith's Falls..	31st Aug., 1907 ...	1 year.
Dempster, H. O....	Beatty, Walter	Delta	30th Sept., 1907 ...	1 year.
McMeekin, A.	Seager, Edmund..	Kenora	15th Oct., 1907 ...	1 year.
Neelands, E. W....	Fitzgerald, J. W.	Peterboro	21st Dec., 1907 ...	1 year.

The following bonds have been approved and filed with the Provincial Treasurer in accordance with the Revised Statutes of Ontario, 1897, chapter 180, section 36, sub-section 2:—

Arthur F. Wells, Toronto.
 George Spencer Abrey, Toronto Junction.
 Robert Samuel McCaw, Welland.
 Samuel B. Code, Smith's Falls.
 Edgar P. Bowman, West Montrose.
 Thomas G. Code, Cobalt.
 Richard S. Code, Cobalt.
 Edward LeRoy Burgess, Ottawa.
 William Hugh Holland, Toronto.
 Herbert Thomas Routly, Haileybury.

Respectfully submitted,

GEO. B. KIRKPATRICK,
 Chairman of Board.

REPORT OF COMMITTEE ON TOPOGRAPHICAL SURVEY.

Your Committee on Topographical Survey beg to report as follows:

It is with satisfaction that we note that the trigonometric survey of Canada, begun in the summer of 1905, has been prosecuted vigorously, and that substantial progress has been made during the past two seasons.

The stations of the chain of triangles extending down the Ottawa River from Ottawa to Montreal, the scaffolding for which had been constructed during the season of 1906, have been occupied, and a reconnaissance carried out from the latter point eastward along the international boundary. A reconnaissance has also been carried westward from Ottawa, and stations established for a chain of triangles covering a strip of country extending back from the St. Lawrence River a distance of about seventy miles. This has reached a point near Belleville.

An isolated piece of triangulation has also been laid out, consisting of six stations, two of which were stations of the U. S. Lake Survey, connecting points on the north shore of Lake Erie with points north of Lake Ontario. Most of these stations have been occupied during the past fall.

Lines of precise levels have also been carried inland along the lines of the railways in the eastern counties of Quebec. These when completed will serve as a control of the vertical components of the positions of points.

It is a matter for congratulation that our long-looked-for geodetic survey is at last in successful operation, and that the aim of those intrusted with its prosecution is to have it equal in precision to the best primary work. The delay in its inception is partly compensated for by the fact that we can profit by the experience gained by other nations carrying on such surveys.

All of which is respectfully submitted.

LOUIS B. STEWART,

Chairman.

REPORT OF COMMITTEE ON ENTERTAINMENT.

Mr. President,—Your Committee had the pleasure of arranging for our 23rd Annual Dinner at McConkey's Restaurant, Toronto, on 26th February, 1908, and the bountiful repast Mr. Mc-

Conkey provided for us more than fulfilled our expectations.

Our courteous President, Mr. Thomas Fawcett, filled the chair with his customary grace, and the vice-chair was ably occupied by our gallant and hearty Vice-President, Major A. J. Van Nostrand. It is to be regretted that neither the Minister of Lands, Forests and Mines, nor the Deputy Minister, were able to be present. We had many guests and a good attendance of members. The usual loyal, social and political toasts were warmly received and responded to, and we were much inspirited from time to time by the dulcet or lofty voices of gifted songsters. Finally the National Anthem brought us all to our feet to pray for blessing on our gracious King and to say good-bye until next year.

REPORT OF COMMITTEE ON LEGISLATION.

The Committee begs to report as follows:

Under date January 20th of this year, the Chairman wrote to each of the members of the Committee on Legislation, namely, W. R. Aylesworth, J. W. Fitzgerald, M. Gaviller, P. L. Gibson, C. A. Jones, A. Niven, James Robertson, T. B. Speight, and E. T. Wilkie, pointing out as the revision of statutes was going on at the present time and the judges are meeting to go over different statutes, that now was the time if anything was to be done with the Survey Act or any of the other kindred Acts with which surveyors have to do, requiring amendment or addition. I asked them to let me know as early as possible what their views were on any particular subject, and that I would try and see if they could not be embodied in the Revised Statutes.

Mr. Fitzgerald replied that he thought in the Registry Act the word "astronomic" should be put before the word "course" where it occurs that the astronomic courses should be mentioned on all plans prepared for registration.

Mr. Speight wrote that as regards section 26 of the Survey Act, the wording seemed to indicate that no proof line is to be recognized as a governing boundary unless the concession in which said proof line lies is abnormal, as described in sections 24 and 25. He states that it is a well-known practice among surveyors to use as governing lines side lines run in the original survey in concessions otherwise normal. That frequent differences of opinion have arisen as to whether the Act gives prior claim as a governing boundary to proof line as mentioned in section 26, or to the several other possible governing lines described in sections 24

and 25, and he suggests that this cause of difference might be removed by specifying the order in which the lines referred take precedence.

As there may be still time to have amendments inserted in the Survey Act or other kindred Acts, it is suggested that any member of the Association who has any amendment to propose would send it in as soon as possible to the Chairman of the Committee on Legislation, when it will receive the attention of the Committee.

Respectfully submitted,

GEO. B. KIRKPATRICK,

Chairman.

REPORT OF THE COMMITTEE ON EXPLORATION.

I regret that owing to the absence of the Chairman, Mr. T. B. Speight, and Mr. Niven, we have been unable to have a meeting of the Committee.

The usual exploration surveys have this past season been made by the Ontario Government in Northern Ontario. Mr. Niven was producing the boundary between the Districts of Thunder Bay and Algoma north to the Abitibi River from the Canadian Pacific Railway, which line, however, he did not finish and he is at present engaged in completing. Mr. Speight was outlining new townships west of the Missanabie River. These exploration surveys have opened up a new section of the province, heretofore unexplored, and they report large areas of good land and valuable timber. The exploration surveys being made by the Transcontinental Railway engineering parties is adding much new information as to the character of our north land, and it is encouraging to know that the more information we obtain of the character of our northern country, the more encouraging it is.

The exploration work of late has been very satisfactory, and the Committee are of the opinion that the work should be continued.

All of which is respectfully submitted.

H. W. SELBY, for Committee.

REPORT OF COMMITTEE ON REPOSITORY AND BIOGRAPHY.

Your Committee beg to report as follows: That we have at present forty large cabinet photographs of members of the pro-

fession, and that it will be necessary in the near future to get another album to preserve them, the present one being full. We have also twenty-three small photographs given by Mr. Unwin some years ago, for which an album has been procured.

We have at present biographies of Hon. Senator Casgrain, O.L.S.; Hon. Senator Vidal, O.L.S.; C. G. Hanning, O.L.S.; Hugh Black, P.L.S.; E. C. Steele, O.L.S.; A. R. Davis, O.L.S.; Charles Kennedy, Henry Smith, O.L.S.; Charles Unwin, O.L.S.; H. J. Browne, O.L.S.; Milton C. Schofield.

We think the time has arrived when some or all of these biographies should be printed in the Report. Some contain very interesting information about the life and work of the writers, and have been sent with the idea that they would be published at once, whereas it has been the practice in the past to publish them very much condensed as obituary notices. Some repairs and additions are needed to the furniture of the Board Room, also locks to the receptacles for the albums and papers of this Committee.

Your Committee would suggest that during the coming year a revised catalogue be made of the books, etc., in the Repository by the new Committee.

Respectfully submitted,

H. L. ESTEN,
Chairman.

REPORT OF COMMITTEE ON POLAR RESEARCH.

Mr. President,—In our Report of last year will be found a summary of the work done by the Committee since 1894.

So far as we can learn, Arctic Canada received but little attention from explorers during the years 1906 and 1907. The interior of Labrador, hitherto unmapped, has, however, been visited, and more than one private party has travelled through our Barren Lands, the objects of the parties being the study of the fauna and flora rather than the exploring and mapping of the waterways.

Capt. Bernier returned safely in 1907 from his cruise in the Government steamer "Arctic," but the official report has not yet been issued. He left Quebec on his last trip on July 28th, 1906, and returned on October 19th, 1907. The principal objects of the expedition were to license whalers and to collect customs dues from American fishing vessels. During his trip he visited the fol-

lowing places among others: Port Burmell, Black Lead, Kekerton (took soundings in Cumberland Gulf), Pond's Inlet, Albert Harbor, Port Leopold, Baffin Land, Bylot Island, Griffith's Island, Cornwallis Island, Bathurst Island, Byam Martin, Melville Island, Eglintin Island, Prince Patrick Island, Louther Island, Russell Island, Prince of Wales Island, Cobourg Island, North Lincoln Island, King Oscar's Land, North Kent Island, Graham's Land, Table Island, North Cornwall Island, Axel Heiberg, King Christian Land, and the Cone Islands. He also explored about 120 miles along the shore of Admiralty Inlet; he repaired Sir John Franklin's monument, and restored the headstones of the members of his expedition who died and were buried at Erebus Bay, on North Denon Island.

Fifty thousand dollars has been voted by Parliament towards another expedition, and Captain Bernier hopes to make a start about the middle of next June, and to get nearer the North Pole on this expedition than he has been able to do previously.

By sending out a properly equipped exploring expedition in alternate years for a decade, the Government would eventually acquire some conception of our long neglected heritage.

An expedition extending over the season of navigation only is but little more than a summer's holiday, but little can be accomplished of value to science or to geography without remaining in the field sixteen months or more.

Your Committee was fortunate in arranging for a lecture by Commander Peary at Massey Hall on the evening of Tuesday, February 25th, the first day of the Annual Meeting of the Association. The Toronto newspapers all reported eulogistically of the lecture and the lecturer, but if you searched them all for a glimmer of patriotic aspiration it would be in vain. The following report is from the "Globe" of the following morning:

"Though disappointed with the failure of his last voyage in search of the North Pole, when he reached the farthest north point yet touched by man, Commander Peary resolutely declared to a Massey Hall audience last night that he would try again, and he believed he would succeed. Peary is only a few months back from the latest effort in the quest which he has made the main objective of his life. Tall, weather-beaten, confident, and yet humble, as befits a man who battles with the unrelenting forces of the frozen north, he is as notable a figure on the rostrum as he is an effective commander in the wilderness. A straight story, narrated fluently without notes, his lecture is spoken from the

heart, and reflects the mind of a man given much to solitude and the quiet confidence which such conditions bring.

"The splendid audience which greeted the lecturer's return to Toronto followed with the closest attention his story of the happenings from his departure from New York in the steamer Roosevelt on July 16, 1905, on through the ice pack, the winter at Cape Sheridan, the sled journey to north latitude 87 degrees six minutes, and the subsequent explorations on the northern coasts, until his vessel limped back to New York last fall. When he reached the point beyond which wisdom, scant supplies and hungry men decreed he could not go farther, he reluctantly turned his face to the south. 'My feelings at this time were the reverse of what you might suppose they would be,' he said. 'It is true we had beaten the record, but it fell so far short of the object upon which I had set my heart for fifteen years that my feelings were those of bitter disappointment.'

"Mr. Peary tried to picture what the North Pole would be like if it was ever reached by man. He naturally declared there would be no pole that one might run against in the dark; there would be nothing tangible, but there would be scientific conditions of note. For example, the wind, no matter from what direction it came, would be a south wind, and all the fixed stars would move across the horizon in a perfectly horizontal direction. In concluding, Mr. Peary defended the expenditure of treasure and effort in the search for the Pole, on the ground of the national and personal prestige it would bring to the successful explorers, and the satisfaction there would be in overcoming the greatest natural obstacles known to exist in the world. He declared his intention of leaving again for the north during the present year."

On his return to New York, Commander Peary wrote the Chairman of the Committee, expressing his thanks to the Association for the magnificent audience accorded him at Massey Hall.

If the lecture served in any degree to stimulate the younger members of the profession towards the possibility of attaining fame for themselves and honor to our country, the work of your Committee will not have been in vain.

We earnestly hope that some member may volunteer to attach himself in some capacity to Commander Peary's next expedition, and thus gain such experience in discipline that may hereafter be of material service.

Respectfully submitted.

WILLIS CHIPMAN,
Chairman.

REPORT OF COMMITTEE ON LAND SURVEYING. :

Your Committee on Land Surveying for the year 1907-08 beg to report as follows:

The members engaged in survey work were so fully employed in the field that they have been unable perhaps to devote the amount of attention to purely Association work that its importance deserves. The members of this Committee are widely scattered, one being engaged in winter work in the wilds of Northern Ontario, and another making his way into the Peace River country. We fear also that apart from stress of work, apathy or comparative indifference on the part of a large number of members of this Association detracts largely from its influence and usefulness. With a general and individual interest proportionate to its importance, and the esprit de corps that should obtain among its members, the efficiency and value of the Association would be largely increased, and its standing before the general public materially advanced.

It appears to have been the practice in the past that committee work should be carried on by correspondence, and while this has the advantage of cheapness, this advantage is more or less questionable. More real work can be done in an hour's discussion in committee than in a year's correspondence. With this fact in view, it has been suggested that arrangements be made to have all committees meet and deliberate on the business in hand one day before the general meeting. In recommending this your Chairman would state that he acts solely on his own responsibility, and may or may not reflect the views of the other members of this Committee, but he is firmly convinced that such a measure, if it can be compassed, will add material strength and usefulness to the work of the Association. The same principle of deliberation might also be applied to the papers read before the annual meeting. These papers are largely technical and well thought out, and as their chief educative value accrues from free discussion and a comparison of the views of the several members on the various points brought forward, it seems to us that some plan should be brought forward to allow for more complete digestion before actual discussion takes place. The present rush methods neither allow due credit to be given to the writer of the paper, nor do they bring out its full value for the other members. Do we find this practice in parliamentary affairs, and are engineering and surveying problems entitled to less consideration?

One other matter that might be placed before you relates to the appointments of engineers to supervise the County Roads system inaugurated by the Government and aided by Government

grants. As far as we can ascertain, these appointments appear to be made as a matter of expediency and ultra-local influence by members of the County Councils, and without consideration as to qualification or value to be obtained for the monetary expenditure. Men are largely appointed who are totally unqualified for the position; no plans, no intelligent examination of the ground is made to enable the supervisor to lay out the work in conformity with the monetary appropriation, and on account of the lack of data and intelligent operation no well regulated and continuous system is possible. If one engineer or supervisor be deposed and another be appointed, and the latter wishes to know the present condition of the roads, he must go over and estimate as best he may their requirements, not knowing what has been already done nor their previous condition. There are no plans from which he may draw this information. In view of the universal importance of good roads, on which subject it is not necessary to expatiate to the members of this Association, it would appear to be desirable to take some action in the form of a recommendation to the Government, whose approval is necessary, that such appointments be placed in competent hands, instead of continuing the present wasteful and unsystematic course.

We should like to point out to the members sending in questions to be answered in the Question Drawer, the desirability of making a specific question rather than a general one, in order that the point at issue may be clearly understood and a satisfactory reply formulated, even though in so doing a greater number of words be found necessary, for brevity and obscurity are close relatives, and lack of full data may bring an answer that falls quite wide of the point desired. In the present instance we have endeavored to answer all questions as fully as possible, considering the data furnished.

Respectfully submitted,

J. MCC. WATSON,

Chairman.

QUESTION DRAWER.

1. In the description in a deed the first part calls for a fractional part of the whole lot and is followed by a metes and bounds description of the parcel. It is found upon survey that the two statements in the description do not agree. Which governs?

Ans.—The statement in the first part of the description calling for the fractional part of the lot.

2. In a will the owner of a whole lot in a double front concession patented as East half and West half, leaves the East half to one person and the West half to another. On survey being made the East half as patented is found to contain three acres of land more than the West half. How should the division be made?

Ans.—If the will merely stated that the East half was to go to one heir and the West half of the lot to another, and contained no other statement to show that a different interpretation was intended, the expressions East half and West half would be construed to mean the East and West halves of the lot as patented.

3. If a surveyor is employed to divide a lot into four equal parts, and upon going on the ground finds that the boundary fences include more than the full lot, but have been in place more than thirty years, thus establishing possession, how would the division be made?

Ans.—There is not sufficient data given for a specific answer.

4. When a surveyor is required to describe the whole or part of a parcel of land of which the existing description is given him, should he designate the occupation he finds as being the same whole lots and parts of lots as stated in the old description, or should he determine with perhaps meagre data the probable location of lot lines and introduce or throw out hitherto unmentioned lots or parts of lots?

(b) Should the practice be the same whether the case concern farm or city lots?

(c) Should the practice be the same whether the adjoining owners are likely to litigate or not?

(d) How would the including of a part of an adjoining lot not before mentioned affect the title of these two adjoining properties? Would it act as a notice of undisturbed occupation and thus confirm the possession?

(e) What responsibility attaches to a surveyor's assumption of the coincidence of a fence with a lot line for purposes of describing and dividing off a new parcel?

Ans.—We do not understand why a survey would be made for description if the old description was to be adhered to. If it were a case where the lot lines could not be accurately determined but the boundaries of the property to which the owner held title were satisfactorily marked on the ground and established by possession or otherwise, the surveyor might plant permanent monuments at the several angles of the property and make these monuments the governing points in his description, thus making the lot line question a secondary matter.

(b) Ans.—The practice would be substantially the same whether farm or city lots were in question.

(c) Ans.—Regarding the possibility of litigation over the boundaries, the surveyor must use his judgment, taking into consideration the special circumstances of each individual case. In general, where it is not possible to locate the lines in such a manner that their correctness may be clearly proven, we would consider it better practice to endeavor to arrive at an agreement between the parties concerned, taking care that when such agreement is reached the division line is marked in a permanent manner and proper descriptions of the parcels embraced in whatever instruments may be necessary in the case, be recorded in the Registry Office to prevent as far as possible a recurrence of the dispute.

(d) Ans.—The mere filing of a description could not affect the title.

(e) Ans.—If a surveyor act upon the best evidence the nature of the case admits of, no liability could attach to his actions, and the only damage possible through errors of judgment would accrue to his reputation.

A communication has been received, signed by Messrs. Smith, Laird and Routly, of Haileybury, requesting an opinion of the Association on the question given below, and that such opinion

should be brought to the notice of the Department of Lands, Forests and Mines. Cases are cited where patents or leases have been issued of parts of lots in surveyed townships and which upon survey were found not to cover the mining claim intended to be included by the applicant for such patent or lease, consequent trouble and complications resulting.

5. Should surveys of parts of lots in surveyed townships be obligatory before patent or lease is issued by the Crown?

Ans.—We would consider this distinctly a matter in the discretion of the said department.

DISCUSSION.

Question 1. In a deed of land a certain part of a lot is said to be conveyed, but the metes and bounds description following is found not to agree with the first statement. Which governs?

Mr. Kirkpatrick—Does he say which part of the lot it is?

Mr. Watson—There is a certain part of the lot and that does not agree with the metes and bounds description..

Mr. Kirkpatrick—The designation governs. If the description differs it only helps to elucidate.

Mr. Watson—That is, if there is half of the lot conveyed, the half governs, notwithstanding the metes and bounds description. That is, if the description calls for the north half of the lot and the metes and bounds description does not tally with it, the north half of the lot governs.

Mr. Kirkpatrick—Certainly.

Question 2. In a will the owner of a certain lot patented as East half and West half, leaves the east half of the property to one person and the west half to another. Upon survey the east half is found to contain three acres more land than the west half. How is the land to be divided?

Mr. Watson—This, I think, is simply a matter of description; it is by the description; if it calls for the east half of the lot you would have to take the patent of the east half.

Mr. Kirkpatrick—That depends entirely on whether it is a double or single front. If it is a double front it is totally different. The easterly half cannot have a bit more in it than the west

half, if you cut an orange in two, each half ought to be the same.

Mr. Watson—This is patented as the east and west half. I don't think there is much in that question; it is a legal matter, whether he means the east half according to acreage or according as it was patented. He owns the whole lot; it was patented as the east and west halves, double front concession; he leaves the east half to one person and the west half to another. There would simply be a question as to what he meant, whether he meant the east half according to patent or according to area.

Mr. Kirkpatrick—He couldn't mean the east half according to area of the whole lot because he is talking about the east and west half of which he has got patents, and he leaves one to one person and another to another person. It is perfectly clear.

Mr. Watson—It is perfectly clear to you because you are used to that sort of thing, but to a man who owned the whole lot, and was leaving parts of it to heirs, he might possibly mean an equal acreage.

Mr. Kirkpatrick—Then he would have to specify: "I am leaving him part of the east and part of the west half to make an equal division of the property."

Question 3. A surveyor is employed to divide a lot into four equal parts, and upon going on the ground finds that the boundary fences include more than the full lot, but have existed more than thirty years, thereby establishing possession. How is the division to be made?

Mr. Whitson—I suppose the fences would determine the boundaries of the lot.

Mr. Watson—If the fences overlap the boundaries what are you going to do?

Mr. Kirkpatrick—He might ask the man, "Do you want your property divided into four equal parts, or your lot?"

Mr. Wilkie—I would hardly think there is sufficient information to make the survey properly.

Mr. Watson—His instructions must be sufficient or else he has got to do the best he can.

Question 4 (first part). When a surveyor is required to describe a part or the whole of a parcel of land of which the

existing description is given him, should he designate the occupation he finds as being the same whole lots and parts of lots as in the old description, or should he determine with perhaps meagre information the probable location of lot lines and introduce or throw out hitherto unmentioned lot lines or portions of lots?

Mr. Dunn—I should think he would follow the old description.

(Second part of Question 4). Should the practice be the same whether the adjoining owners are likely or not to litigate over the matter?

Mr. Watson—It doesn't make any difference whether he is up against a law suit or not.

Mr. Bolton—If you make the same description you are not liable. It is the easiest way out of the difficulty to avoid a lawsuit.

Mr. Watson—I think so, too. The best thing you can do is go on and establish the line as it stands there now, making a sub-division plan up against it and refer to that otherwise.

(Third part of Question 4). How would the including of a part of an adjoining lot not before mentioned in the description affect titles of the adjoining properties? Would it act as a notice of undisturbed possession and thus confirm the title?

Mr. Watson—That is supposing he went on, as I understand it, and made an even description, made his own lot lines, and they didn't tally out with what was occupied under the old description, he wants to know whether including part of another lot not before mentioned in the description would affect the title of the adjoining properties, or whether it would act as a notice of undisturbed possession?

Mr. Whitson—Did he send you a copy of the description?

Mr. Watson—It goes on: What responsibility attaches to a surveyor's assumption of the coincidence of a fence with a lot line for the purpose of describing and dividing off a new parcel? That is, if he goes on and finds the fence there and it is not the lot line, as he would place it, has he any responsibility? Could they send him down to the county jail or anything? That is, as I understand it, whether he ought to go on and make his own sub-division, or whether he should simply accept what has been taken as the line?

Mr. Bolton—It depends whether the fence has been up there eight or ten years.

Mr. Watson—I don't think so; it doesn't make any difference for the sub-division.

Mr. Bolton—I think he would require to notify all the other parties and have an understanding as to whether that was the line or not. You find these lot lines vary constantly.

Mr. Watson—A fence might have been put up and run from an original post forty or fifty years ago, but the people who could establish that point are gone. You can't get anybody else whose opinion would be taken as evidence there. It is better in that case if you can form a reasonable idea to take that.

Mr. Kirkpatrick—Wouldn't he divide it up and plant his post and point out to the man that his responsibility was then over? If he holds any other part of the lot by possession the mere planting of the post would not establish it.

Mr. Watson—The trouble is the Act requires you to establish your points by originals. Where surveys have been made 80 or 90 years ago you can't get men who can establish those points.

Mr. Kirkpatrick—But you can establish how long the fence has been there.

Mr. Watson—Oh, yes; but the average judge would not take that.

Mr. Kirkpatrick—If I exhausted every source of information and found there was no person who could give me primary or secondary evidence as to the post, I would simply divide up and tell the man: "That is the true boundary of your lot; I have nothing to say as to your possession of another man's lot. If you have that by possession, of course the law will give it to you, but I have tried all I can do to find evidence of an original post; you can't show it to me; none of the adjoining owners can show it to me; I can hear of no person that can; you can't say that you ever heard that that original fence was put up from the original post or that anybody ever heard of that post." If you do all that, I don't know what else you can do but divide up.

Mr. Watson—You can't do anything, because no matter how you describe it, the man has got an idea that a surveyor should come along and be able to positively establish the line.

Mr. Kirkpatrick—I know that, but that is not his responsibility.

Mr. Watson—Yes, but he does not think that, and very few of the judges do. I know of a case in our county where a surveyor

ran a line, and he had run a compass line some years ago in the concession across the road, a double front concession; as the people didn't want to pay anything for it, it was merely a rough line. There were some people on the other side of the road cutting timber, they went to work and picked that compass line up and produced it through, and the person on the other side thought they were trespassing, and he called on the same surveyor again. He took an observation and ran a transit line through. The case came up in court and the judge established the compass line produced on the other concession on a different bearing altogether, simply because he couldn't establish the original point. It was reversed on appeal, but that is not a very nice thing to be up against all the same.

A Member—Has a surveyor any right to run a rough line like that?

Mr. Watson—Certainly he has, if he is given full latitude. He is not inside of the law at all. I don't think in every survey a person takes up, that he is bound to comply exactly with the Act that it should be done with a legal line. The judge established this line from men who were not competent at all taking the old compass line and producing it across into the other concession.

Mr. Bolton—That is merely across the road.

Mr. Watson—Yes, but the judge had no business to establish it.

Mr. Kirkpatrick—You say it was reversed on appeal?

Mr. Watson—Yes.

Mr. Kirkpatrick—If he had taken an astronomical course and it was run from the original post, it wouldn't govern.

Mr. Watson—The judge should know, and if he doesn't know, he is not competent to fill his position.

Mr. Kirkpatrick—I think if the surveyor was produced he should make the man examining him point out that particular thing.

Mr. Watson—I don't know whether he did or not, but I think the judge should know.

Mr. Kirkpatrick—I don't know; the judge never knows anything except what the lawyers bring before him.

Mr. Watson—Well, then he doesn't know very much. He ought to know what he is basing his decision upon.

Mr. Kirkpatrick—He ought to know.

Mr. Wilkie—The judge decides the case on the evidence before him.

Mr. Watson—I don't think he does. He couldn't do it in that case; all he has to do is look up that section of the Act.

Mr. Wilkie—In this particular case you speak of, where the compass line was established, the judge did so on the evidence before him.

Mr. Watson—I think the judge should know; he should not be humbugged by lawyers.

Mr. Wilkie—They take what is put before them; they don't take the trouble to ascertain whether these things are in accordance with some certain statute or something else.

Question 5, Sub-section 2 of Section 28 of the Survey Act requires the side lines in certain townships to be run on the astronomical bearings stated in the original field notes, but excepts such blocks in the said townships where any line was run prior to July 1st, 1897. If a line be found on the ground, how is a surveyor to determine whether or not it was run previous to the above date?

Mr. Kirkpatrick—We had that question up in the examinations and there was a very curious interpretation put upon it by one of the students. I had to ask him how he read that. He thought in every case in which there was one line run in any section he was to adopt the astronomical course of the township, whereas the Act says the exact reverse. Any section in which any single line was run in that section before the 1st July, 1897, all lines in that section or block must be run in accordance with the course of the side line that was run.

Mr. Watson—That is the way in which I understand it, although it is not very clear.

Mr. Bolton—That means the line was run in the original survey of the township?

Mr. Watson—No.

Mr. Kirkpatrick—Any private survey in which a line is being run in any block is not to be governed by the astronomical course on the plan and field notes, but by the course of the line on the ground. If it is the line between 6 and 7 it has to be governed by the sideroad between 5 and 6 all the way through the section; you are not to stop because one was run in the first concession and there was no line run in the second concession. It says the block. You must recollect that every one of those nine other lots in that

section are governed by the same governing line that that one line was governed by.

Mr. Watson—That is all right on paper, but if a line be found on the ground, how is a surveyor to determine whether or not it was run previous to the above date? (July 1st, 1897).

Mr. Kirkpatrick—That he has got to find out by enquiry.

Mr. Watson—There may not be anybody there.

Mr. Kirkpatrick—He must find somebody. I admit it is a pretty hard thing to do.

Mr. Watson—He may find somebody out of self-interest to say it was run before 1897.

Mr. Kirkpatrick—Cut out a block of timber and count the rings and he may find there were certain rings which proved it had been run before 1897—.

Mr. Watson—You might get that on ten years blazes, but on blazes made within three or four years it would be a pretty hard thing to do.

Mr. Bowman—Supposing the line that had been run had gone round one of these old mining locations?

Mr. Kirkpatrick—A mining location was not a block.

Mr. Bowman—Supposing the line that had been run had been broken by a mining location?

Mr. Kirkpatrick—But we have always carefully told the surveyors to run the line through the mining location, but not to blaze it.

Mr. Bowman—That is what I should have done, but I thought I might as well raise that point.

Mr. Watson—The question (5) goes on: "Is the expression 'any line' in the above sub-section intended to apply only to lines run in the proper legal manner prior to July, 1897, or would apply to, say, a rough compass line run through the block without proper precautions having been taken in its location? Now there are a lot of lines through that country that have been run by lumbermen. What are you to do?"

Mr. Kirkpatrick—No person is entitled to run a line except a licensed surveyor.

Mr. Watson—The question (5) continues: "If it apply only to lines run according to the proper legal practise prior to July, 1897, how is a surveyor to determine whether or not the line was

properly run?" How are you going to investigate those points? Supposing I come along to a block like that and I find a line there and there is nobody living there; that line might have been run by a surveyor or a lumberman; a surveyor might have run a compass line; he might never have got the proper sub-division, or he might have chained it down the distance shown in the field notes. They run up a compass line, and the lumberman, or whoever it is, won't pay for it; how do you know whether that line was run properly or not? Must you go to work and go up the side-line and make up your sub-division to see whether it tallied before the Act of 1897 or not?

Mr. Kirkpatrick—I don't think I would care whether it was run right or wrong. If it was run by a surveyor, I could tell pretty well by the way he blazed the trees. I lumberman never blazes a line properly. If it was blazed and I found it run 15 years ago, I wouldn't bother my head whether it was run right or wrong; I would run my lines in that section right. I would let the compass line stand for what it was worth.

Mr. Whitson—Why should you enquire particularly whether the line is run properly or not?

Mr. Watson—That is what I want to find out. Supposing it came up in a lawsuit and the surveyor hadn't enquired or found out or couldn't give evidence as to whether that line was properly run or not, would that throw him out of court?

Mr. Whitson—I think it would be wise for him to run that line to the proper bearing.

Mr. Watson—It might be a surveyor's line or a lumberman's line. How are you going to find out these things?

Mr. Whitson—How are you going to find out whether any line is the original line or not? You are in no worse position.

Mr. Watson—I think you are in this case, because in the original line you can get at the date. There are no local surveys made for a great many years afterwards, as a rule, in the vast majority of townships; but in this it says "any line" or "any block." A lumberman's line would be a line, or a surveyor who ran up there without defining the property, that would be a line I suppose. It depends what that means. I would call it a line if a man cut a line through a bush and blazed it.

Mr. Code—I wouldn't, because it wasn't done under authority.

Mr. Whitson—All lines referred to in the Act refer to lines established by a surveyor.

Mr. Watson—Supposing a surveyor didn't make a proper subdivision, and he simply ran a compass line through there?

Mr. James—A surveyor running a rough line should not blaze it.

Mr. Watson—It would be no use if he didn't blaze it. The man cutting timber wants it blazed or he does not know where he is.

Mr. Code—In that case I would say it was only a line when it was run by a surveyor.

Mr. Watson—He might run a rough compass line. He may not at the time have intended it for a true line, but it is very hard for the surveyor who comes on ten or twelve years after to find out his intention.

Mr. Code—He couldn't, particularly if the surveyor was dead. I think the statute is not explicit enough.

The President—Would you mind reading that second question again?

Mr. Watson reads Question No. 2.

Mr. Whitson—I think Mr. Kirkpatrick answered that question.

Mr. Watson—It is simply a question of description. If he says the east half of the lot, you have got to go by the patent; if he says the east half of the property, you might consider the acreage. The east half is the patented half, and it does not make any difference about the west half.

Mr. Green—Then I would understand that the lot is to be divided as it is patented? Of course Mr. Watson may know the circumstances of the case, but they are not stated in the question.

Mr. Van Nostrand—The question is incomplete. That is surely clear to anyone who understands the Survey Act. If it is a double front, it is quite possible to have different areas; if it is a single front, you can't have different areas any more than you can have more than two different halves.

Mr. Watson—It is simply a question of good or bad description in the will.

The President—The distinction is between half of the lot and half of the property. The property would mean the area; the lot would mean the lot as it is described in the description, which would be half of the lot without taking any account of the area at all.

Mr. Green—Would it not do to subdivide that lot as it is patented?

The President—Yes.

Mr. Green—Wouldn't that be the answer to the question?

Mr. Van Nostrand—Certainly.

The President—We all might differ on that last question. I know, for my part, it would be necessary that there should be evidence to prove that the surveyor had run a line in blocks; and whether the line be run correctly or incorrectly, if it were run by a surveyor, as long as the evidence was satisfactory that the line had been run, I think I would accept that; and I would run the lines in the direction of the governing line. I think I would take the responsibility of doing that rather than run on the astronomical course in the field notes, although the line might be run wrongly.

REPORT OF COMMITTEE ON DRAINAGE.

Mr. President,—Your Committee on Drainage, while able to report an excellent year in the matter of surveys for drainage work, is unable to throw much light on the matter of litigation.

The situation, owing to the reports of decisions, is becoming somewhat clearer to members of the profession having practice in this line, but litigation is perhaps more than ever regarded as a prolific source of income.

I have to embody in this report the opinion of one member who states that "The Ditches and Watercourses Act never was and never will be a useful and workable Act until a Referee is appointed to try appeals in place of County Judges, and this Referee should be an O. L. S. of at least ten years' standing and should have to assist him two non-residents, and the decision of this board should be final."

From time to time defects have been pointed out regarding the Ditches and Watercourses Act, and in some counties decisions have been rendered that are apparently at variance with decisions on similar cases in nearby counties. The method of procedure in removing the adjustment of differences from the field of the engineer to the judgment of the County Judge, who must rely on the evidence and is often handicapped by lack of engineering knowledge, seems at times a step in the wrong direction, but engineers must work under conditions as they find them, and there is still a strong demand for the engineer who can compile a report that will stand the cross-examination of the lawyer for the appellant.

It is to be hoped that procedure will be simplified in some way to carry out the original intention of the Act without the large expenditures now in evidence, but the parties who are to do the simplifying will have to "take on" the best bunch of fighters the country possesses.

The inspection of ditches at the time of completion under the Ditches and Watercourses Act seems to be a proceeding that although it is clear enough in the Act, is but little required, and in few cases does the engineer inspect.

The ease with which work under the Drainage Act is initiated is refreshing, coming after the severe restriction of larger schemes by the often-mentioned case, *Sutherland Innis v. Romney*. It is

still apparent that in case of an injuring liability assessment, that specific examination of each lot and parcel of lot is required to ascertain the amount of artificial work. The division of outlet liability and injuring liability remains difficult and is sometimes extremely hard to define.

The fact that certain County Judges refuse to recognize as Township Engineers men who have no professional standing or who are not Ontario Land Surveyors is commendable. There seems to be an increasing number of men who are acting as Township Engineers without any such standing, and this should be discouraged.

Government aid in certain cases is an important element in initiating drainage schemes, and your Committee commends this as an easement to sometimes severely taxed areas.

Topographical surveys in drainage suits are viewed with favor in the Courts, and where the work is done with the transit level, stadia and magnetic needle, the cost of performing such is small compared with the benefit to be conferred by plans of this kind as evidence.

Owing to the increasing scarcity of timber there is increased demand for concrete culverts to take the place of wooden structures, and the adoption of a simple and yet artistic type of concrete or reinforced concrete bridge is being advanced.

The necessity for making the affidavit to be taken by the engineer under the Drainage Act *before* undertaking the survey is apparent from some recent decisions of the Drainage Referee.

All of which is respectfully submitted,

A. S. CODE,
Chairman.

PAPERS.

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SOME THOUGHTS AS TO THE ORIGIN OF EARTHQUAKES.

BY FREDERICK W. WILKINS, O.L.S., NORWOOD, ONT.

The subject of the following paper, which I shall entitle "Some Thoughts as to the Origin of Earthquakes," was suggested to me by having seen, just prior to the San Francisco catastrophe, a statement somewhere that a very celebrated scientist had investigated the form of the earth mathematically, having regard to the known speed of rotation on its axis, its density, etc., and all other things then known (150 years ago) about it in a physical sense, or surmised about it, and had come to a surprisingly close, comparatively, by this abstract method, of the just-about-at-that-time-ascertained elements of the earth's form, and showing thereby that the difference (1-300 or thereabout) found by geodetical methods between the earth's polar and equatorial diameters was and must be correct. This struck me at the time as a little singular, seeing that at that time (150 years ago) it was universally supposed that the earth we know and walk upon was but a crust or shell-covering of no great thickness, of a liquid or semi-liquid mass forming the interior, and that this known part but the cooled outside of a mass that at one time was all liquid. Obviously this state of liquidness or rigidity, in its degree as such, must have been an important factor in determining its form and the time of it as to its synchronism with a certain rate of rotation must of surety have had a very great deal to do with its determinations—that is, as to whether it was very liquid or very rigid at the assumed rate of rotation. If we should assume that at or near the beginning, when gravity and substances were first instituted, that a certain quantity of matter found itself in a certain position in space, having all its particles exactly alike in all senses, and having no cohesion among its particles, being held in position by gravity only, and having no axial or any other motion, it would seem from all we now know of the law of gravitation that these said particles would arrange themselves into the form of an exact sphere.

Suppose that it be now endowed with a very slow rate of axial

motion; in an instant it would assume another form, that of an oblate spheroid, the lesser axis being that of rotation. This change of form, as I have said, would apparently take place instantaneously; but suppose a certain degree of cohesion to exist among these said particles, then time would now enter as a factor among the other conditions, and according as the cohesion was more or less and the speed of rotation more or less, would more or less time be expended before a stable condition be come to and fixed form be arrived at. Now, fixed form is the keynote of my earthquake ideas. But if the earth ever was in a gaseous or fluid-divided condition, as has been supposed by some, then something such as I have outlined above—a quantity of matter in space—must have actually conditioned, and coming on from the condition, must have developed into what we know as the earth, the world, wherein, or on, we live. Let us assume this, and let us further come down to about the present epoch of time, for discussion's sake and for the sake of comparing notes with the aforementioned mathematical demonstration or deduction. First item, there are certain matters of condition about the earth's motions which point strongly to the conclusion that the earth has not always rotated on its axis at its present rate. The fact is certain that its speed has varied, and there seems no reason to doubt that at one time, at least, its speed was much greater than at the present time. Let us assume this also, and let us again further assume that this was a condition through a vast period of time, beginning in the embryo or early stages of the earth's growth, and that during it the matter forming the earth changed from a non-coherent mass of particles (at least, for a long way in from the outside) to a well-adhering solid core or mass of rocks and metallic substances, the existence of which is now a certainty.

Now, from our first premises, that a globular form (oblate spheroid) of large eccentricity would result, and if the very high rate of rotation be maintained for a very long period, so that a great degree of cohesion obtained for a very considerable distance in from the outside (an assumed condition at the present time), it is plain that we would now have a very decidedly fixed shape to the earth's body—one not easily changed, and certainly not instantaneously so. That the rigidity of the earth is very great admits of certain mathematical demonstration, for taking the tremendous daily impact of the tides on the masses of land, it can be shown that so far, at least, as the eastern side of this continent is concerned, it must be at least as rigid as a solid armor-plate of the best steel twenty-five miles in thickness is. Now, so far as we know of the rocks which form the rigid part of the earth's body, nothing at all comparable with this is found. The rocks on the outside (baked by

the sun) are much firmer than those below them, and thus it would not be at all fair to take them at their outside strength, but much below this, for comparison. There are also a number of other things beside this that make it almost conclusive that the earth is solid to the centre. This is the prevailing view nowadays, anyway, and it seems like common sense to assume that the centre of the earth (or near it) should get solid first. The motion of rotation at or near the earth's centre is little or nothing, while at its surface it is very considerable; thus one would suppose it would be much more liable to consolidate at that part, and that thus the earth solidified or gathered cohesivity together from the centre outwards, and is thus entirely solid, rather than from the outside inwards, as the crust idea conveys. Further, this idea would seem to combat the notion of intense internal heat for the earth—and this notion of intense internal heat seems inexplicable to me on other grounds, and plainly thus would greatly affect certain views as to the cause of volcanoes.

But to pass on. Suppose, now, that the earth reached a solid condition while still rotating at a much greater rate of speed than at present; then upon a slowing down (gradual, or otherwise) of its actual motion (and I firmly believe this to have taken place, and is perhaps imperceptibly doing so still), we would have a well-maintained rigid form (especially if the slowing down was gradual) not in conformity with the shape it should take as a result of this slowing down. The extra mass at the equator (13 miles thick at the present) would exert more and more pressure on the underlying mass of rocks, etc., and gradually cause these solid constituents of the earth's body to flow towards the poles, and this I believe is actually and actively going on at the present moment. Of course this extension of the earth towards the poles is extremely slow of necessity, and more and more so as it approaches its true shape as time goes on. Hundreds of years must elapse before geodetical methods would detect any difference, for it is not probable that we know even now the exact diameter of the earth at any point much nearer than two hundred feet. Now, let us suppose this rate of extension to be only one inch yearly—perhaps it is not even so much as this; but take it at that, and for the sake of discussion, so as to easily take in what the effect would be, let us imagine the earth divided in half at the equator and each half drawn in the direction of its poles until one inch intervenes; this space, then, a cylinder 8,000 miles across and one inch long, would thus represent the volume of change in form by the above polar elongation, and would equal about 800 cubic miles in content—that is equal to a cube greater than nine miles on each side. No small hole would this be, either, if applied in one place; however, it

would be more or less distributed, the sinking-in thus occasioned being much more pronounced towards the equator, and nothing at all at about half way to the poles.

Now, the outer beds of rock forming the outside part of the solid earth are much firmer and stronger than the inside, being sun-baked, and in such a subsidence as supposed there can be no doubt but that the softer rocks of the interior would draw away from the upper and harder rocks, and would thus form a cavern, or more likely, caverns, under which by their subsidence, more or less sudden, a thing certain to happen, cause all the varied forms of seismic disturbances. If one cavern were thus formed in a year it would be approximately, say, 1,000 miles square and seven feet high at the centre. Suppose five caverns were thus formed—one for each of the great ocean basins—then if each of them be 1,000 miles square, the height would be, say, seventeen inches; as each of these vast caves (or their equivalents) would develop, they would, of course, fill in with water, petroleum, gas, etc., etc. Suppose, now, that the rocks forming the under part of the roof of one of these caverns has reached its limit of endurance as the gradually widening cavern is thus formed, and suddenly comes down, great rushes of the gaseous or liquid substances that had infiltrated here will now take place, causing the rushing, rumbling noises in the earth often heard at the times of earthquakes. This subsides and all is quiet for a time, when all at once the rest of the roof gives way, and premising the rocks forming this part of the roof are hard and firm (very likely to be so), a fissure or fault takes place in them, reaching, perhaps, for hundreds of miles across the country. Down drops one edge of the fissured rocks the 17 inches mentioned so suddenly that a tremendous wave is directly propagated in the inclosed liquid filling, causing the overlying strata on the surface of the ground to rise like a wave on the ocean, and as it passes along, to fall into the trough behind it, and thus to oscillate to and fro for some time; or it may be that the falling edge of rock may catch part of the way down and again slip, or may do so several times, thus causing many rockings of the ground or “quakes” before subsiding, when the disturbances cease for that time. Suppose, again, that one of the caverns maintains itself for a number of years through having a strong, rocky roof; then when it does come down, terrific are the results, and the heat thus produced by the friction of the rubbing rocks so great as to melt the rocks and thus cause the volcanic eruptions.

But I have said enough for the present. How easy to imagine how and to account for tidal waves and kindred phenomena occurring in the oceans, the countless fractures in the rocks and their

filling in with vein matter, the metamorphic condition of stratified rocks, etc., etc. By far the greater number of dreadful seismic catastrophes have occurred near the sea coast, and this easily comes in line with those ideas, for as is well known from pendulum observations, the rocky strata under the sea are much less dense, and others probably much less rigid, than those composing the dry land; and this, connected with the daily on and off pressure, tremendous in potentiality, of the tides, seems to offer a very strong presumption that this is the true origin of earthquakes. Many more interesting deductions are admissible in this connection, but perhaps this is enough, or more than enough I hear some one say.

DISCUSSION.

Mr. P. S. Gibson—I suppose, with regard to the San Francisco earthquake, it might be in place to remark that a great many people consider it from a theological standpoint. It was supposed that San Francisco was a very wicked city, and was visited with the earthquake as a judgment. I am not surprised with the views expressed with regard to this, because we have an astronomer who says that our earth, instead of going around the sun, as we generally suppose, floats a certain distance away from the sun and revolves but never gets round the sun; but as I said before, I would rather be inclined to take the San Francisco earthquake up as a theological question. It is an easy way of getting out of it. (Laughter).

I heard a theory of this kind one time; it was promulgated by a gentleman who thought the earth was made in such a way that the water cannot escape, because if it goes down it is heated and comes up in steam, and if it goes up it is frozen and comes down in hail.

Mr. Sewell—The generally accepted theory is, it was more or less a matter of steam. We know well enough that our volcanoes are often situated near the seashore, where they can imbibe moisture through the fissures of the earth, and in that case the water percolates through the fissures into the heated mass down below and forms steam, and by and by it brings about an explosion. Now it is generally known that before volcanic eruptions earthquakes frequently take place. That is one class. But then there are a number of others, like the San Francisco earthquake, which cannot be accounted for in that way. Those must necessarily be from the faulting of the rock. Where you have a rock of a soft nature close to one of a hard nature, a fault or slip takes place, and that is generally supposed to have caused the great San Francisco earthquake.

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DRAINAGE AND THE DRAINAGE ACTS.

BY C. A. JONES, PETROLIA, ONT.

Mr. President and Gentlemen,—In a moment of weakness or absent-mindedness, I really cannot tell which, I complied with the request of our worthy Secretary, that I should write a paper on Drainage and the Drainage Acts, but when I afterwards began to deliberate in a quiet, pensive mood, upon the subject, I thought how foolish I had been, for I could think of little or nothing except what had been pretty thoroughly threshed out at previous meetings, which left me in rather an awkward predicament. However, I shall endeavor to bring before your notice a few points which may be of interest to some of the members who are actively engaged in drainage work.

A case which for the first time during my practice occurred last year, was one in which the parties owning land on the north side of a blind line petitioned for a drain to run along the southerly side of said blind line, not for the drainage of their own lands, but to cut off the water flowing on to them from the lands on the other, or south side of the blind line, which were not included in the area described in the petition. The lands on both sides were, of course, assessed for the cost, and the parties on the south side from whose lands the water flowed, appealed to the Drainage Referee, and I was called on in the interests of the respondents. His Honor held that the parties petitioning had the right to do so, even though they admitted in court that the work was a cut-off for them and not for drainage, as they drained their lands into another drain which ran through the opposite end of their farms.

Another point which has come to my notice recently is this: Has a single individual the right to petition for a drain under Sec. 3 of the Municipal Drainage Act by including his own farm or contradiction constitute a majority? I have not as yet had a only, in the area to be drained, by which he would without doubt or contradiction constitute a majority? I have not as yet had a case such as this come before me, but I have heard of one being

successfully carried through. I believe it was not contested in any court to test its validity, and I should be pleased to hear from any of the members if they have had any experience in a case of this kind, or if they know of a decision in any court on this point.

If I may be permitted, I would suggest a few amendments to the Drainage Acts, as follows:

Sec. 85 of the Municipal Drainage Act, I think, should be repealed. This section refers to an agreement being entered into between the Municipal Council and the railway for the construction of drainage work on or across the property of the railway company, and the consent in writing to said agreement by the majority of the owners interested in the said drainage work; but Secs. 250 and 251, Cap. 37, of the Revised Statutes of Canada, 1906, does away entirely with the necessity of this, and places the railway company on the same footing as any other land owner, excepting that it gives the company the privilege of doing that portion of the work which lies on their right of way, and also the right to appeal to the Board of Railway Commissioners if they are not satisfied with the proposed work. The same may be said of Sub-Secs. 1 and 2 of Sec. 21 of the Ditches and Watercourses Act, which reads nearly the same as Sec. 85 of the Municipal Drainage Act, and Sub-Sec. 3 of said Sec. 21, which refers to the \$1,000 limit of cost of work, could be slightly amended in its wording so as to read properly with Sub-Secs. 1 and 2 omitted.

Should the above amendment to the Ditches and Watercourses Act be made, then Sub-Sec. 2a of Sec. 16 would, I think, be unnecessary. It reads as follows: "The period prescribed for the engineer to make his award shall be exclusive of the time required to obtain the approval of the works or the specifications or plans thereof by the Board of Railway Commissioners for Canada where such approval is necessary."

Again, Sub-Sec. 2 of Sec. 66 of the Municipal Drainage Act, which reads as follows: "Where in any such case lands and roads in another municipality are assessed for the drainage work, the Council of the initiating municipality *shall* procure an engineer or surveyor to make an examination of the work and to report upon it with an estimate of the cost of completion for which sufficient funds have not been provided under the original by-law, and shall serve the heads of the other municipalities as in the case of the original report. plans, specifications, assessments and estimates; and the Council of any municipality so served shall have the same right of appeal to the referee as to the improper expenditure or illegal or other application of the drainage money already

raised, and shall be subject to the same duty as to raising and paying over its share of the money to be raised, as, in the case of the original by-law, is provided by sections 62 and 63," is scarcely workable, as an engineer coming on the work at this stage finds it difficult to give an exact estimate of what it will cost to complete the work. If the contract is let by the rod, then the council or commissioner on the work will know exactly what it is going to cost to do the work, and if it is by the cubic yard, then the engineer coming on in the middle of the work has little or no better means of giving the exact estimate than the engineer who laid out the work in the first place. Again, how does the engineer know what has been expended either for actual work or for incidental expenses such as solicitor's fees, expenses, say, for Court of Revision, appeal to County Judge or Drainage Referee, or what bridge allowances may or may not have been paid, which would all be included in the total estimate of cost to complete the drain.

Would not this section be better amended somewhat after the following manner (3rd line): shall immediately after the completion of the work procure a statement or report of the total actual cost of the work, certified to by the treasurer of the municipality and the engineer or commissioner in charge of the work, and if sufficient funds have not already been provided for under the original by-law, the Council of the initiating municipality shall serve upon the heads of the other municipality or municipalities as in the case of the original report, a copy of the said statement or report, showing the amount advanced out of the general funds of the initiating municipality for the completion of the drainage work, with a demand for their pro rata share of same, and the Council of any municipality so served shall have the same right of appeal, etc., etc.

DISCUSSION.

Mr. Bolton—I think you all would agree with me that there are a good many things in the Ditches and Watercourses Act that could be made a great deal plainer, and also as far as the Drainage Act is concerned. There is one point in Mr. Code's report about the County Judge going on the land. I know I have had considerable experience myself in that way, and I have found it is a very hard matter to get a judge to understand conditions; as a rule he is

going along and walking over the land, and if it is a particularly fine or a wet day, he is paying more attention to the weather than the conditions on the ground. You cannot get a judge to get into his head the conditions on the ground; and I think if a referee were appointed, a man of experience in law, and a man who has some knowledge of engineering and surveying also, it would be a much better thing. I think in both of these papers there are some very good suggestions.

Mr. Code—The point taken by Mr. Bolton is simply in line with what I have always thought. It is very hard to get a judge to go out and take a look at things. We have to give judges all the credit due them, they are legal lights, but their engineering knowledge is necessarily restricted, and the main trouble I find is that legal gentlemen never see mathematical proportions. If we could only get them to see things in mathematical proportions it wouldn't be so bad. But, the present referee lately has taken a good step when he starts to make an examination in every case that comes before him. The trouble is that then we see each of the two sides, the barrister and somebody else will provide him a rig and take him out and show him the place. However, he gets around that in very good order. In Mr. Jones' paper he mentions giving notice to other townships than the initiating township. I think we could get around a good deal of that by placing our estimates high enough, and giving them the rebate, instead of asking them to put up more. Although the point is well taken, I find it the case that an estimate is not nearly high enough often.

I don't think there is anything I can add, except I always try to discourage any work under the Ditches and Watercourses Act. In the eight or nine townships I act as engineer for I suppose there are not more than three or four awards to make under the Ditches and Watercourses Act. I have tried to educate them in that matter, and it is working well.

Mr. Newman—As to the appointing of a surveyor and two assistants to him, it seems to me that the whole nature of the Ditches and Watercourses Act is for small and unimportant drains that the cost in every case should be reduced to a minimum, and for that reason, principally, among others, I don't see the value of two assistants. If a surveyor goes onto the ground and makes a through examination of it himself and then hears the evidence of the parties interested, I don't see why he is not thoroughly capable of giving a fair and impartial decision on it, by using his own judgment; whereas, if there were two others he would be simply the presiding officer. I really don't see the advantage of it from a monetary standpoint in particular, or from a practical point of view.

Mr. Ure—I think that section is practically a dead letter. I notice, in my experience, I have never had a case.

Mr. Newman—I didn't mean for drainage viewers, but speaking of Mr. Code's recommendation of a surveyor and two assistants in place of the County Judge.

Mr. Ure—I thought you were referring to that section where two viewers were appointed. I don't know of a case where that has been carried out. It has never been carried out in any of the townships for which I act.

Mr. Newman—That is wholly optional, at all events.

Mr. Ure—As far as leaving the matter in dispute to the County Judge, I have never had any trouble in that line. I have a great many cases under the Ditches and Watercourses Act, but I have very few appeals, probably not one in five years, on the average, and in such cases the judge has always viewed the ground, and he has refused to accept the evidence of the interested farmers as against the disinterested engineer. He has told them plainly if they wished to succeed they must employ another engineer to go over the ground and show him plainly that the award was wrong, or else he refuses to make any changes. I don't know that there is enough work or enough appeals under the Ditches and Watercourses Act to make it worth while to appoint a referee; I doubt very much if there is. There are some amendments proposed there which I think it ought to be someone's duty to look after. The Statutes are being revised. Section 85 is a dead letter and might as well be wiped out. Possibly it will be. In the revision of the Statutes the men take cognizance of the Dominion Act under which railway companies are now dealt with. There are some amendments to the Ditches and Watercourses Act, I believe, being proposed at the present session. I rode down on the train with a member from South Oxford, who proposed to wipe out this distinction. There are some sections of the Act that apply to Counties east of Frontenac and do not apply to Counties west of Frontenac. He asked me why that distinction was made. I couldn't tell him, unless I thought probably some member down east of Frontenac had a particular case he wanted to cover. He was proposing to wipe out that distinction. One of the sections dealt with the rods—they have 90 rods east—and he asked me if I thought a **greater** limit should not be placed also in the west. I think a **great** amount of justice would be done if the limit were placed at probably 150 rods. We, of course, take conditions as we have them and make the best of them; still, the law could be improved. I think the Ditches and Watercourses Act is being used less than it was, and will be

used much less in the future, because under the amendments passed about two years ago to the Municipal Act, one or two petitioners can put through almost any drainage scheme they wish, until the courts decide or give a ruling upon the meaning of that amendment. At the present time I know, I myself, and other engineers, are putting through numerous schemes this year that could not have gone through at all before that amendment was made. None of them have been contested, so that we cannot tell how the courts will rule; that is with reference to limiting the area described in the petition to one or two or three lots and getting the majority of those to sign the petition. It has gone through all right so far. I don't know how it may fare when it gets into court.

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THE PEACE RIVER DISTRICT.

BY H. W. SELBY, O.L.S., TORONTO, ONT.

Although this subject is not essentially one to interest the Ontario Land Surveyors, in view of the fact that we have a north country as interesting, if not more so, than the subject of this paper, still I thought a few remarks relating to that distant portion of Canada might broaden our ideas and make them less parochial in their limitations.

The Peace River District is that portion of Canada which lies nearly in the centre of the territory granted to the Hudson's Bay Company by Charles the Second in the year 1670, and purchased by the Dominion Government from the company in 1869. Up to that date settlement had been discouraged; only the officials of the trading companies and a few intrepid explorers had ever ventured within its borders. Little had been known to the outside world of the great possibilities of this enormously rich area of land, until the past few years or upon the advent of the railways into the prairie portions of the country. Now the last West is being invaded, and after that, where next? According to the statement of the naturalist, Ernest Thompson Seton, who has lately returned from a trip into the so-called "Barren Lands," or, as it is termed by another writer, "The Top Country" of the continent, there is a whole Province of good arable land northwest of Hudson's Bay awaiting the coming of the adventurous spirits, where the conditions are such as to lead to the conclusion that what has been done in Manitoba and Ontario even can be done up there. In the words of a writer in the Technical World Magazine, "The Barrens of the North" is what they "used to call this whole Top Country;" but Nature never did such bad balancing as to weigh down a continent, whose "lower regions are inestimably rich, with a worthless top, and to the north end of the American Continent it gave a full share of attractiveness and riches. They are a bit hard to get at, it is true, but Nature's idea in caching them thus far away probably was merely to keep them in reserve until men needed them enough to go after them."

Any further digression from my subject must be left for some future time. Now I will take you through the Peace River District

only. First, let me ask you how many realize how far one has to travel to reach Edmonton, the rising city of the West, but still only the gateway to the great country beyond? Do you know that in travelling by express train from Montreal to Edmonton within a few hours of as much time is occupied as it takes a C. P. R. steamer to cross the Atlantic Ocean? Do you still further realize that by travelling as far as from Montreal to Toronto, in a north-westerly direction from Edmonton, a settlement of about one thousand people are found living comfortably and growing all the grain and vegetables required for the use of the community, and raising more cattle and horses than are required for the various purposes of that number of people, and that means many more than would be found among the same number of people here? Then continue northerly another three hundred miles, you pass through a settlement on the Peace River of over two hundred people living upon good farms, growing everything needed by man and beast, and down the Peace River to another settlement of over two hundred, where there are farmers growing from 75 to 300 acres of wheat annually, which is ground in an up-to-date roller process flour mill and then shipped still down the Peace and Mackenzie Rivers, on electric lighted steamers, and distributed among people living nearly as far from Edmonton as the people of Halifax from London, England. Why, gentlemen, it is hard to realize anything about it without actually travelling the country over. Those who have never been west of Sudbury will find it difficult to appreciate how far one can travel in Ontario before seeing the first glimpses of western life. After one has become fully conscious of what that means, it will then be possible to have a conception of what travelling over three times that distance means, and still to be in Canada, and not only in Canada, but in a good land, not, as depicted by Kipling as "Our Lady of the Snows," but in a land where agriculture in all its branches can be followed; where fruits and flowers in all their lusciousness, beauty and perfume are found, and where the horse (the pride of our eastern fellow-citizens, that is housed, petted and blanketed) out there roams at large, feeding on the luxuriant grasses all the year round, with the flimsiest of shelters provided in case a severe storm should render it necessary to feed him with hay for a short time. Railroads have shortened the distance from one place to another so much we lose the feeling of vastness truly applicable to the extent and beauty of our great and prosperous Dominion.

We will now begin our journey to the Peace River country from Edmonton, a city which in 1903 had a population of less than 2,000, and which by the latest census claimed 19,000 dwellers therein surrounded by a fertile plain, every section having one or

more occupants, for from 50 to 75 miles in almost any direction, growing everything required for their food except some kinds of fruits, with unlimited supplies of coal underlying the whole district, and with lumber and other building material of easy access.

From this city of great promise we travel over a fairly good wagon road northerly 96 miles to Athabasca Landing. Some of this country is not surveyed nor settled, but at intervals good shelter for man and beast is found at reasonable prices, with hay and oats for the horses and meals for small parties at 35c per meal. At Athabasca Landing a message can be sent by wire to your partners, wife or sweetheart. This village is organized, has police protection, and nearly all the annoyances of civilization except the sound of the steam whistle on the railway engine. This is expected soon. It is beautifully situated on the bank of the Athabasca River, from which the general level of the country rises in plateaus about 500 feet. Down the river a great deal of the merchandise for the north is sent by steamer and large flotillas of barges, the loading and departure of which in the summer months gives the village a very busy appearance. Quite a number of farmers have settled within easy distance, and most of the oats required by freighters and others is grown by them. From this place, going by steamer up the river 75 miles, we reach the Lesser Slave River, then up 20 miles of rapids by York boat and 100 miles by steamer across Lesser Slave Lake. If driving, there are wagon roads on the north and south shores of the River to Lesser Slave River, then by a good road to Lesser Slave Lake; thence around the lake, following the beach, to the village at the west end of the lake. This village is at present the objective point for all people coming into the Peace River country. Here one can rest awhile, to make necessary repairs, replenish the larder, go to church, or do anything you may require to do, besides acquiring information as to the country beyond. Here are found the Roman Catholic and the English Church Missions to the Indians; both with good buildings and churches, stores, sawmill and flour mill. Both have farms and cultivate enough land to raise wheat and oats for their own use, and cattle for milk, butter and beef. Opposite the village are large meadows, where thousands of tons of hay are put up, and where hundreds of horses and cattle pasture, many of them all the year round. Here on the first of July, and sometimes for two or three days after, hundreds gather to celebrate our national holiday, coming from all over the country to join in the sports and visit their friends. These sports consist of horse races of all kinds and for various distances; riding contests for men and women; running races for all classes, male and female; jumping,

high, flat and vaulting; trick races of various kinds, such as "100 yards dash and come in with your pipe lighted," 100 yards race carrying a man and returning, having changed places; obstacle race, over and under all sorts of hurdles, bars, wagons, nets, etc. The cowboy race is generally well contested, and a race for half a mile, removing the saddle while running, is keenly enjoyed. These celebrations are held generally on a flat some three miles from the village, where each family erects its habitation (a tent or tepee), bringing supplies and blankets for the holiday. Large tents are put up for restaurants, where those not provided with food can get their meals and where ice cream of the most delicate flavor is sold to the unsophisticated, and fruit, candies and nuts for the young people who desire nothing better than getting rid of their money. Some of the horses are tethered out and many roam at large. Gambling and betting on the several events is indulged in to an unlimited extent, at least to the extent of their pile, and when that is gone to the extent of all they can borrow. Music and dancing engage the attention of the young men and women from nightfall to early morning, and dresses white in the evening look very much soiled by morning. This celebration has become an institution of the country, and the busy and picturesque canvas town given over for two or three days to sport is visited by the stranger with almost as much interest as one visits the Mardi Gras in the south or the National Exhibition, with its attendant attractions. One naturally wants to know why so much is said to entice people to this far-off land. Is it a purely agricultural country? Or are there fortunes awaiting those who want to invest in timber; or is the possibility of finding rich deposits of minerals the attraction? No, I think not. It is the natural "Lure of the Labrador" feeling; the desire of so many of our restless fellowmen to see the West. They have heard of others who have gone west and made money. "I will go and see the West," they say, attracted by the language of some of the many articles written upon the subject. I will quote a few extracts from a widely circulated paper, the highly colored language of which, like the enticing literature of a systematically advertised patent medicine company, acts with impelling force and results in probably the same proportion of success and disappointment.

"Coal, oil and gas are the three wonder riches of the north. Timber and fur, iron ore, and even gold, one would expect to find as typical northern resources. The whole north land above the present line of rail is a region of mineral wealth which in its nearer limits takes the form of the largest gas and oil reserves in the world, and farther north of coal beds no one knows how large.

Where Nature has been so lavish as to keep burning up and still have plenty left, it may be taken that she is filled and soaked with combustibles—solid, liquid and gaseous—and there is every evidence of great subterranean lakes of petroleum. There is hematite iron ore; gypsum near the mouth of the Peace River; stone suitable for building; clay that will make brick, and sand which can be turned into glass. There is gold in the sandbars on the Peace River in such quantities that miners have been panning out from ten to fifteen dollars per day, but the greatest of the north land surprises are those of the farm land. Instead of the vast stretches of empty barrenness with which the north has been synonymous, there are tracts of rich prairie identical in character and possibilities with those to the south. The Peace River country is claimed to be one of the most fertile districts in the West, and in every way fitted for agricultural settlement. It is a country of rolling, flower-strewn prairie, where wheat grows 30 bushels to the acre and oats 100. Fort Vermillion, 700 miles straight north of Edmonton, is the farthest north agricultural settlement in America, and there a crop of 20,000 bushels of wheat from something less than 1,000 acres was one man's record last year. At Fort Providence, in latitude 61.25, the middle of July in a normal year finds potatoes in flower, peas fit to use, strawberries ripe and gone, and nearly every variety of garden vegetables and fruits in healthy growth; and Fort Good Hope, ten miles south of the Arctic circle, produces potatoes any farmer in Aristook County would be proud of, and while this comes of tillage, the northern soil of its own natural richness grows aspen, poplar, birch, all along the Mackenzie River to its Delta, and spruce almost to the Arctic Ocean. Both timber and wheat are milled at Fort Vermillion, where a well equipped roller process flour mill grinds the grain grown in the district, and a sawmill produces lumber from native-grown spruce and tamarac."

While every word of this is to a certain extent true, still to the ordinary person who takes such things to be simply as stated, after he has gone, seen and discovered the truth, is very likely to be always a disappointed man. Now this is unfortunate, because the Peace River District, and hundreds of miles on either side of it, will be the home of many thousands of happy and contented farmers in the future, and many towns not thought of yet will spring up as centres of mining districts. Railroads will soon be built into the north, but it will be mainly through a bush country. The prairies spoken of so attractively in the article quoted from are narrow strips, a few miles in length, generally along the bank of a river or lake. The timber areas, that is to say, those

suitable for timber berths, are almost unknown, but small belts of spruce are found scattered all over the district north and west of Edmonton, from which sufficient for the needs of the settler may be cut. No large areas of poplar over 18 in. are found, but scattered nearly all over the district bluffs of large poplar, white and black, and cottonwood, have been seen, but generally on the land suitable for agricultural purposes the timber is small poplar and willow. Large tracts of the country consist of rough hills, with the attendant coulees deep cut by the spring freshets, and many muskegs occupy thousands of acres. Of course much of this country might be utilized, but it is a question for serious consideration whether the authorities should not reserve these from settlement or occupation or even drainage. A large area of land is lost for settlement along the shores of nearly all the large rivers and the smaller streams which empty into them, from the fact that these streams have cut a channel from 500 to 1,000 feet deep through the country, and by a succession of landslides, in some cases as far back from the river as a mile and more, has left the country too rough to cultivate. Small flats have been formed here and there along these large rivers, which when settled upon invariably produce the best of grain, etc. Frost never affects these flats, since a fog or mist always occurs after a frosty night, which protects the growing crops from the first rays of the sun and until 9 or 10 o'clock. The climatic conditions have been a great surprise to the public generally. The observations as to temperature have shown that the Isothermal line of 57.30 in the three summer months extends northwesterly from Lake Manitoba to Lake Athabasca, and thence westerly and southerly along the foot of the Rocky Mountains. This line includes an area of land greater in extent than this great Province of Ontario, in which the climate is suitable for successful agriculture. This is largely owing to the low altitude of the country and the length of the day, which is nearly 20 hours in summer. The Peace River District lies well within this area of successful agricultural possibilities, and that taken together with the long day of sunshine and the influence of the winds from the Pacific, with rather more than the usual rainfall, constant growth is the result. In fact, observations have shown that wheat has matured in 86 days from the time it was sown.

I have endeavored, gentlemen, to give you a mind picture of the Peace River District. This has been done, I hope, faithfully; much wealth may be made there; many people may live there; large areas of land may never be occupied. Many may go there and not realize their expectations, which may be said of all

portions of this continent.* It might very rightly be argued that the trend of emigration would be better directed if the clay belts of Ontario and Quebec, and even north parts of New Brunswick, were first occupied. I am not here to say anything on these points, for or against, but will close my remarks with a few figures compiled by the Census Bureau relating to the occupied part of the Northwest, which may be as applicable to the unoccupied country, which is probably as good as that from which these figures are taken.

Up to the end of the year 1907 eighty-five million acres of the Northwest had been alienated from the public domain. Out of this immense area five million only were under wheat crop last year. We will suppose that the selection of this eighty-five million acres did not include any great areas of land not suitable for agriculture, but to be safe on this point we will say twenty millions, or nearly 25 per cent., are not fit for that purpose. The wheat crop then stands in the ratio of 1 to 13, or representing about seventy-five millions of bushels of wheat, and applying the same ratio to the possibilities of the Peace River District and the country within the area of which it has been stated successful farming or wheat growing can be carried on—a country greater than that of the whole of Ontario, and the figures almost paralyze one—add to these, if you can, the mineral wealth of that large tract of country, and even as loyal citizens of this great and rich Province, we may still, without treason to our beloved Ontario, be proud that we are Canadians.

[This Association is not responsible, as a body, for the opinions expressed in its Papers by Authors.]

OUR TIMBER RESOURCES AND LOSSES BY FOREST FIRES.

BY J. F. WHITSON, O.L.S., DEPARTMENT OF LANDS, FORESTS AND MINES.

What has become of our original forests? What use have we made of them, and what steps are we now taking to preserve for future generations their supply of timber, are questions which I deem worthy of consideration by this Association. As our future success as Land Surveyors is in a great measure dependent upon the development of the timber, agricultural and mineral resources of Northern Ontario, we must not lose sight of the fact that the preservation and judicious management of our forests are invaluable factors in the interests of colonization, the maintenance of our Provincial revenue, and the employment of labor. It is more particularly, however, the question of forest protection I wish to draw the attention of our members to in this paper.

Lumbering began in Canada over two hundred years ago on the St. Lawrence. Operations reached the City of Ottawa a hundred years later. In 1806 the first raft of square timber floated away from the mouth of the Gattineau; for the next 50 years operations in Ontario were confined almost exclusively to the Ottawa River and its tributaries, and the Trent waters below Peterboro.

Between 1800 and 1855 we had cut out the finest of our white pine forests. As early as 1840 operations had extended almost to the head waters of the Madawaska and Bonnechere, and had reached Lake Traverse, on the Petawawa, as early as 1855, and in that year square timber was made on the Jocko, at the foot of Lake Temiskaming. In 1856 no less than three and one-half million cubic feet of board timber was cut on the Madawaska and 15 million cubic feet above the City of Ottawa. Lumbering operations were also active on the Trent waters as early as 1840, and had reached Indian Point, on Balsam Lake, in 1855, and 60 miles up Burnt River and far into the interior in 1860.

Little or no lumbering had been done in Western Canada

except for local consumption, until 1858, when the first raft of square timber left Big Creek, on Lake Erie, for Tonawanda. Square timber and spars were shipped from the vicinity of Barrie, Orillia and Angus, near the Georgian Bay as early as 1864; logging had even begun on the north shore of Lake Huron, on the Spanish as early as 1863, and a few local mills had started operations before that time. Little had been cut in Muskoka, Parry Sound, Nipissing or Haliburton District until after 1860. From 1860 to 1870 operations were pushed north through Addington, Hastings, Haliburton and Muskoka, and along the shores of the Georgian Bay. Between 1870 and 1885 operations had reached the shores of Lake Nipissing from the east, south and west, and were active in many places along the north shore of Lake Huron from the French River to the Soo, extending inland for a distance of 40 miles.

Between 1885 and 1907 operations have extended into all the new districts and have in many instances reached the head waters of the streams flowing into Lake Huron or the Ottawa River, have extended as far west as Rainy Lake and Lake of the Woods; in fact, lumbering has been carried on wherever a pine tree is to be found, and I verily believe that if reports had been published years ago that there was a raft of square timber to be had around the North Pole, it would have been located long ago.

Prior to 1857 the Province was divided into four sections, according to the character of the pine:

- (1) The white pine country, extending from the City of Ottawa to Pembroke, having a length of about 100 miles and an extreme width of 40 miles, covering the Counties of Carleton, Lanark and Renfrew.

- (2) Beyond that the red pine country, extending from Pembroke westerly to Lake Nipissing, a distance of nearly 130 miles, having an extreme width of 50 miles.

- (3) The hardwood country, covering the territory at the head waters of all the streams flowing into the Ottawa, Lake Nipissing and the Georgian Bay, or what is now included in our Algonquin National Park.

- (4) The rocky and isolated region on the shores of Lake Huron, which was then practically unknown.

The white pine country, which was more or less an agricultural country, has been all cut over years ago or destroyed by fire. The same remarks will almost apply to the red pine district. The hardwood country has nearly all been square-timbered over, and

in fact logged over, although there is still a few billion feet of pine still standing. The country to the east of Lake Huron and to the north extending inland many miles, has since that date been partly lumbered over or partly devastated by fire, and to-day the greater quantity of our pine timber still in the Crown is to the north of Lake Nipissing and west of Lake Temiskaming, and on the head waters of the streams flowing into the Georgian Bay and in the District of Rainy River, north of the Minnesota boundary.

The most valuable of our hardwood timber was burnt by the early settlers when clearing off their land, or used as fuel, and to-day there is no hardwood forests left to compare in area or quality like the original forests of the Indian Peninsula, the Huron tract, or the older part of Ontario bordering on Lakes Erie and Ontario, as hardwood is found only in small sections north and west of Lake Huron; neither can we compare our present pine forests to those which have been cut or burnt over in the last 50 years.

FOREST FIRES.

It is to be regretted that careless operations in the past by lumbermen have done much to lessen the supply of timber in this Province. On carefully examining the reports of the surveys and explorations made prior to 1855, I find that nearly all of the Huron and Ottawa territory, including the Districts of Haliburton, Muskoka and Parry Sound, the Counties of Addington, Hastings and Renfrew, were practically a virgin forest of mixed timber, pine predominating, with only parts of a few townships burnt over. Prior to 1860 a virgin forest covered the territory on the upper branches of the Trent waters. In that year, however, a fire broke out on the Burnt River, in the Townships of Snowdon and Glamorgan, in Haliburton, caused by a trapper's smudge. In 1851 the first fire of any magnitude to visit the Ottawa Valley commenced at the mouth of the Bonnechere River and burnt over what was locally known as the Big Pine country. This fire originated from the burning paper of a musket fired by a river driver. In 1868 the Bissetts Creek country, from the Ottawa River to Lake Traverse, on the Petawawa, was devastated, and in 1870 the Skead limits on the Opeongo. In 1876 the country from the Petawawa to the Bonnechere River met the same fate, having arisen through the carelessness of a river driver. In these few fires alone the Province lost several billion feet of our finest white and red pine. To-day you will scarcely find a township in the white and red pine country that has not been burnt or partly burnt over, and in many instances the fires have swept over them several times.

A. P. Salter, who between 1855 and 1857 outlined the north shore of Lake Huron from Lake Nipissing to Sault Ste. Marie, and extending back from the shore nearly 40 miles, describes the country as a vast forest of green timber, scarcely a burnt area was met with. The country was not as heavily timbered with pine as was the Ottawa Valley; there was, however, large areas of excellent pine and other mixed timbers. Since that date a series of fires have reduced the pine area north of Lake Huron by almost one-half.

They began in 1864. The fire of 1864 was the first destructive fire to devastate the north shore. It began near Otter Tail Lake, on the Thessalon River, and worked its way west into the old cutting around the Bruce Mines and east to Blind River, where it reached some old saw log cutting by a French-Canadian by the name of Salvoil. Continuing east along the shore, it reached the mouth of the Serpent, where it destroyed a local mill owned by Lauzon; here it met fresh fuel in the old cuttings and continued east to the Spanish, and up that stream for many miles, almost the entire southern slope of the Killarney Mountain being swept over from White Fish west to Collin's Inlet. While this fire was burning, a fiercer fire was, in August of the same year, working its way west from the west arm of Lake Nipissing until they met somewhere in the Valley of the Wahnapiatae. But this was an incipient fire compared with the one which followed it in 1871. The fire of 1864 followed the dry, moss-covered rocks and small pine ridges, but when it struck a deep swamp or muskeg it stopped or smoldered until it was revived by high winds or found fresh fuel in some of the old timber cuttings. The winds and storms of six years leveled down the dead timber, piling windfalls around the skirts of swamps and muskegs. The fire of 1871 started almost at every point of the compass along the north shore from French River to Kaministiquia, on Lake Superior. The season was exceedingly dry and hot. It swept over the dead timber and brule of 1864, destroying swamp barriers that saved the pineries six years before; clouds of smoke, tipped with a fringe of flame, swept from one hill-top to another, lakes, rivers and swamps formed no barriers or protection. Township after township was swept over to the south of the French and millions of pine destroyed. It extended up that river, along the west shore of Lake Nipissing, up the Sturgeon, swinging around westerly, it crossed the Wahnapiatae and continued to the head waters of the Spanish, up the Vermillion, and west to the head waters of the Mississauga and down that stream for over fifty miles. This fire swept with fierce energy over an area of more than 2,000 square miles, leaving black

ened and giant pines to be a reminder for more than half a century of the immense destruction there and then caused, converting a virgin forest into a barren and desolate wilderness.

During the same season numerous smaller fires broke out in different parts along the north shore of Lake Superior, around Port Arthur and points east. Exploration surveys were then being made of the Canadian Pacific Railway, and many fires were started through carelessness on the part of men employed. An axeman on Mr. David Beatty's exploration party started a fire by burning out a wasp's nest on the line east of Red Rock, on the Nepigon River, which Mr. Beatty was unable to quench. He and his party were forced to flee for their lives and take refuge in a stream, but unfortunately six of his packers were overtaken and perished in the flames.

Probably a more extensive fire than that of 1871 was the fire of probably 1855, which was started by an Indian on Lady Evelyn Lake, while burning over a blueberry patch, which burnt easterly to the shores of Lake Temiskaming, up the Montreal River to its source, and westerly along the height of land for over 200 miles to near Michipicoten, on Lake Superior. Surveyors Salter, Gilmour and Sinclair, in their reports of 1867 of their base line from Michipicoten to the Montreal River, describe vast areas of burnt-over territory, and from the trunks of trees then standing they were able to state that the country at one time contained a heavy growth of pine. I can do nothing better than quote Salter's own words: "Almost the whole of this district appears to have been devastated by fires at different times and at periods more or less remote, which swept away the original forest, some remains of which are still to be seen in the shape of huge trunks of pine, blackened and charred by the fire. The country to the north of my line along the height of land has been swept over by fire, and now is for an area of 2,000 square miles a desolate wilderness, and from the remains still standing was formerly covered with pine, etc."

Vast areas west of Lake Superior, along the southern boundary of the Province as far as Rainy Lake, which at one time contained large quantities of pine, were destroyed prior to 1857, probably about the year 1845. These fires burnt over thousands of square miles, both in Ontario and Minnesota. From the top of a high mountain on Hunters' Island no less than 1,000 square miles of just such country can be seen, extending as far as the eye can carry in almost every direction.

Coming down to more recent dates, I might mention the fires

of 1877, which burnt over extensive areas in Parry Sound; the fire of 1891, which swept along the Canadian Pacific Railroad for nearly 60 miles from Pogamasing Station to near Woman River, and a more recent one which burnt over the same territory in 1896 and the entire shores of Biscotasing and Ramsay Lakes, and from the head waters of the Spanish and Mississauga Rivers to near Flying Post, north of the Height of Land, a distance of over 70 miles. These two fires alone devastated over a million and a quarter acres. Being an eyewitness of this fire, I am able to form some idea of what a forest fire in a pinery in a dry season is, and how utterly impossible it is to check it. I might also mention the fires of 1894, which swept over Northern Minnesota, destroying over 140 souls, which fire crossed Rainy River into the Rainy River Valley, burning over several of our newly-settled townships and destroying the lives of six members of a family by the name of Gamsby.

I might mention numerous smaller fires, all of which have played their part in destroying our forest wealth, but space will not permit.

RAILWAY TIES.

One of the greatest drains on the timber resources of this Province is the consumption for railway ties, telegraph poles, bridge timber, etc., being nearly one-fifth of the entire output.

The total length of railroads under operation in Canada at the end of 1907 was 22,450 miles, with 3,000 miles additional under construction, besides 1,067 miles of double track, or in all a total length of 27,600 miles, including sidings. Of this length, Ontario has the greatest mileage, totaling 7,640 miles. It required 83 million ties in the original construction of these railways, 23 million of which were used in Ontario, nearly 3,000 ties being required per mile. It is estimated by railway companies that the average life of hemlock, tamarac and jack pine ties is about seven years. From these figures it will be seen that in every seven years the railways of Canada will require nearly 83 million ties to keep their lines in repair, of which Ontario's share will be 23 millions, or an annual requirement of 12 millions for the Dominion. In Ontario for the next five years we will require annually, including new lines, $4\frac{1}{2}$ million ties. Within the next five years at least 1,500 miles additional of new lines will be constructed in Ontario, 1,000 miles of Transcontinental line, 200 miles by the Grand Trunk Pacific from Fort William and Lake Superior Junction, and about 300 miles of Canadian Pacific and Canadian Northern lines, not to mention other short lines, making a total mileage in 1912 in Ontario of over 9,000 miles. We will then require annually, in Ontario, four

million ties to keep the roadbeds in repair. It is estimated that one million ties will cut out from 26 to 32 million feet of lumber, so that the railways of Ontario will require, per annum, 120 million feet in B. M. for ties, besides large quantities of bridge timber, telegraph poles, etc. How we are to meet this demand is a problem hard to solve, for the demand to-morrow will be greater than to-day and the source of supply less.

The C. P. R. Co. has been in operation about twenty-three years, and in that time nearly all the tie timber along almost the entire line of railway from six to twelve miles on either side, except in a very few localities, has been cut over or destroyed by fire, and the same remarks will almost apply to the Canadian Northern from Port Arthur to Winnipeg, although in operation less than half that period, and the companies have now to draw their ties long distances or bring them in by branch lines or streams. Manitoba and the Territories have very little tie timber, and must look to this Province for a partial supply, and to-day the Canadian Pacific and the Canadian Northern Railway Companies are shipping ties from Ontario to points as far west as Calgary and Edmonton, as they find it cheaper than to bring cedar ties from British Columbia. A shipment of ties was made from Australia some time ago by the C. P. R. Co., of Jarrah wood, the duration of which is estimated at fifty years, but they were found to be so hard that no spikes could be driven. They cost \$1 per tie at Vancouver. Spruce will not make ties, although occasionally used; the life, however, is not more than from three to four years, and cannot be used where there is heavy traffic. We must, therefore, look to our tamarac, and we have no great quantity of that owing to the tamarac blight which swept over all Northern Ontario and Quebec a few years ago, killing almost the entire growth from St. John to Port Arthur; or to our Jack pine, of which we have, fortunately, large quantities in some sections, although not so much as might be expected. Not one-tenth of the timber in the virgin forests over the height of land is suitable for ties, but rather for pulpwood.

Good ties to-day are worth on the line of railway from 40c to 60c per tie, and oak ties \$1. On the stump they are worth from 8c to 20c. Tie timber in the next ten years will be difficult to get within a reasonable distance of any of our railways.

Over five million ties will be cut in Ontario this season off Crown lands, and great numbers besides off private lands. The United States require annually over one hundred million ties and three and one-half million telegraph and telephone poles and thirty-seven billion feet B. M. of lumber per annum. How they will supply the demand in the near future is a problem hard to solve.

It is therefore our duty, as a business proposition, to protect by every possible means the tie timber forests now remaining in Northern Ontario, and to find some method whereby the life of a tie will be prolonged.

Throughout the entire District of Rainy River and over a great portion of Thunder Bay, we have 25 million acres of land growing up with a thrifty growth of Jack pine, spruce and small tamarac, which in twenty years more, if properly cared for, will produce millions of ties. The same remarks will apply to large sections of Algoma and Nipissing, and even to sections of Parry Sound, Muskoka, Renfrew and Haliburton. Roughly estimated, there is 30 million acres of that class of land not included in any of our forest reserves or lands under timber license, or the lands suitable for agricultural purposes in the northern clay belt, which could be made tie-producing under proper supervision and protection from forest fires. Railway contractors' careless methods in the past in cutting ties have been extremely destructive and are directly or indirectly responsible for many bush fires. In the early days of railway construction they were allowed to take ties from land adjoining the track, where most convenient. As a consequence they left a slash on both sides of their line from end to end exposed to sparks from every passing locomotive, or the careless section man, when burning off the right of way every spring. No care was ever taken in burning the debris or even piling their brush. The almost unavoidable sequence in such cases was the forest fire, and if the past careless methods of cutting are allowed to continue, we will see a tie famine in a very few years, probably in 12 or 15 years, unless it is found practicable to treat ties by some chemical process such as that used very extensively by the Carbolite Carbolineum Company of Toronto, which they claim will more than double the life of a tie at an initial cost of 25c per tie. (Railway men inform me that they prolong the life from two to four years.)

Besides, railways require large quantities of cedar for telegraph and telephone poles. There is very little of this timber north and west of Lake Superior, in fact there is very little north of the height of land. The Ottawa Valley and the north shore of Lake Huron have still considerable, but there is no cedar in Northern Ontario like that in Old Ontario, neither in quality or quantity. The pole period is probably shorter than the tie one, as cedar is not found as a second growth in the north over large areas, and only in its original forest in narrow fringes along the banks of streams or shores of lakes. The dense cedar swamp is seldom met with.

If the figures I am about to give as to the growth of timber are correct, and assuming that one-tenth of the timber growing in the north is suitable for ties, and that an acre will produce a tie every 15 years, we should then have tie timber enough to supply the growing demands in Ontario for many years to come, and perhaps indefinitely, if we can eliminate fires. We must, however, make some allowance for losses even under the best possible management, as will be seen from past records. Our present fire system, as introduced into this Province in 1886 by Mr. Aubrey White, Deputy Minister of Lands and Forests, is undoubtedly the most efficient in any Province or State, yet fires have occurred of late years which have been very destructive, although insignificant compared to those which occurred prior to 1886.

The area of the Province, exclusive of the Great Lakes, is 126 million acres. The area surveyed, 46 million acres. The area unsurveyed, 80 million acres. The area sold, 24 million acres. The area under timber license, 12,800,000 acres, in which is included some patented lands. The area still in the Crown, 102 million acres unpatented or 89 million unlicensed lands. The area of Forest Reserves, $10\frac{1}{2}$ million acres. The area of virgin forests and burnt-over lands, not including Forest Reserves, $78\frac{1}{2}$ million acres. After deducting, say, $8\frac{1}{2}$ million acres for water and useless muskeg lands, we have 70 million acres outside our Forest Reserves to produce timber, of which 40 million is a virgin forest, almost untouched by fire, and 30 million acres of inferior land burnt over or partly burnt at different periods and timbered with second growth from one year to 50 years' growth. Half of this 30 million acres at the end of 50 years would be a fairly good forest of merchantable timber. The growth would not be less than $2\frac{1}{2}$ cords per acre every 50 years, or 5 cords per 100 years. This would be equivalent to $1\frac{1}{2}$ million cords annual growth on our inferior and partly burnt-over areas, but we will take safe grounds and assume that our virgin forest will produce the same amount. Then we have an annual growth of two million cords on the 40 million acres, or $3\frac{1}{2}$ million cords in all, worth \$2,100,000 at 60c per cord; at the lowest possible calculation, it could not be less than two million cords per annum.

PINE AND PULPWOOD FORESTS IN ONTARIO.

The Government of Ontario, with a view to perpetuating the supply of pine timber, set aside three large Forest Reserves, the timber on which is being conserved to be disposed of, subject to stringent conditions. These lands are protected from fire during the summer season by a large staff of fire rangers. Settlement is entirely excluded, also mining, where the lands are espe-

cially valuable for timber. These Reserves comprise an area of nearly $10\frac{1}{2}$ million acres—the Temagami, 5,900 square miles; the Mississauga, 3,000; the Nepigon, 7,300; the Eastern, 100, and a small Reserve in Sibley Township. Besides these Timber Reserves there is the Algonquin National Park, with an area of 1,930 square miles, one object of which is to conserve the water supply at the source of several large and important streams.

On three of these Reserves there is an approximate stand of seven billion feet B. M. of red and white pine, besides large quantities of pulp and tie timber. In other sections of the Province there is also large blocks of pine, and from approximate estimates made it would appear that there is on lands of the Crown to-day a stand of 12 billion feet B. M., besides several billion on the twenty thousand square miles now under license, which is subject to a royalty of from \$1 to \$2 per thousand feet B. M., and on which the Crown has derived a revenue of $15\frac{1}{2}$ million dollars during the last ten years, or $1\frac{1}{2}$ million dollars per year, nearly 10 million of which was for stumpage dues—indicating an annual cut of from 750 million to 900 million feet B. M. At the present rate of cutting this would almost indicate a pine famine in Ontario at the end of twenty years. It is hoped and expected, however, that under the present efficient fire system and management we will be able to so far protect the young and growing pine on our many million acres of cut and burnt-over territory that the annual growth will supply the future demands.

The pine now standing is worth \$10 per M., B. M., or 12 million dollars. The highest price paid for a virgin pine forest prior to 1867 was \$1 per acre. In that year the north-west one-quarter of the Township of Anson, a fine pinery, brought \$640 per mile. A few years ago a limit sold by the Government brought nearly \$32,000 per mile, besides \$2 per M. stumpage. In 1856 the revenue for all Canada from woods and forests was \$228,436; 31,500 square miles were under license; 12,400,000 cubic feet of white pine square timber was cut; 748,500 white pine logs, and 1213 red pine. In 1863 the revenue from the sale of timber and for dues in Ontario amounted to \$197,000, in 1870 to \$426,000, and in 1872 to \$600,000, and from Confederation to date, to \$39,160,000; the total amounted to approximately one million dollars per year. The total cut of pine from Confederation to date amounts to over 29 billion feet B. M.

While the Province has a great wealth of pine, it is richer by far in her immense virgin forests of pulpwoods along and over the height of land, in which scarcely a tree has yet been cut. These pulp lands comprise a belt extending from the Interprovincial

boundary between this Province and Quebec, westerly for a distance of over 600 miles, having a depth north and south varying from 100 to 150 miles, bounded on the south by the height of land and on the north by the swamp lands to the south of James Bay and the Albany River, the most densely timbered portion lying between the Provincial boundary and Lake Nepigon and to the north thereof, comprising an area of over 40 million acres, and although much of this area has not been explored yet, 2,500 miles of base and meridian lines have already been run through it and 100 townships subdivided, comprising nearly 2,625,000 acres, and one and one-half million acres outlined into townships. From the most reliable reports of the surveyors and explorers, I am confident that a conservative estimate of the quantity of pulp woods over this area is not less than 250 million cords. More than half of this is tributary to the Transcontinental Railway or to Lake Superior by the Nepigon River. Sixteen million acres of this territory is fine agricultural clay land, almost unbroken by lakes or rock exposures, and heavily timbered with spruce, poplar, Balm of Gilead, and Jack pine. The Transcontinental Railway is being constructed through it from east to west. It is watered by seven large rivers, the Albany having a length of nearly 500 miles, tributary streams of the Moose and Albany Rivers having each an average length of over 250 miles. These streams will act as highways to float the enormous quantities of pulp and other timber to the railway, and are capable of supplying sufficient water power for manufacturing purposes, and we may reasonably look forward to the erection of numerous pulp and paper mills, sawmills, and other industries.

A pulp mill like the one at Espanola on the Spanish River, capable of consuming from 40 to 50 thousand cords of wood per year, grinding from 150 to 200 tons per day of pulp, will employ 800 men in the woods from seven to eight months of the year, and 250 in the mill. 250 million cords will require 100 mills grinding day and night for 50 years, employing 100,000 men and teams. The annual growth over so great an area, if carefully protected from fire, will produce more pulp than is consumed annually in the United States. It is estimated by foresters that an acre of good land will produce from 25 to 75 cubic feet of wood per year, or from one-fifth to three-fifths of a cord; one-fourth of that is probably nearer the mark in our northern climate of commercial timber, say one-twentieth to three-twentieths of a cord of merchantable timber. On the clay belt and all north of the height of land there should certainly be an annual growth of two million cords, assuming three cords per acre in 100 years sufficient to supply 50 mills. The forests of Prussia produce 42 cubic feet of wood per year;

Bavaria, 55; Baden, 59, and Saxony, 90, of which possibly one-tenth would be merchantable in this country. These countries derive a revenue of from \$1 to \$4 per acre per annum from their State Forests. We derive less than 2c per acre, or 12c per acre from our licensed lands.

In 1906, 3,638,000 cords of pulpwood was consumed in the United States for domestic pulp, of which 738,000 cords were imported from Canada, mostly from the Eastern Provinces, as Ontario is not permitted to ship pulp out of Canada except from lands patented prior to 1897. In 1898 the United States consumed only two million cords of pulpwood. The consumption has doubled in the last ten years. In 1897 Canada supplied the United States with 102 thousand cords; a cord of pulpwood will cut about 500 feet B. M. About three-fifths of the wood used in the mills of the United States is spruce, the balance chiefly hemlock and Jack pine. A cord of first-class spruce will make a ton of merchantable pulp; on an average, however, it requires 137 cubic feet as measured in the piles. An acre of fairly good spruce will produce over 10 cords. In the District of Rainy River and south of the height of land, there is, besides the area above described, approximately 50 million cords scattered over a large area, making our total stand of pulpwood 300 million cords, which is worth from 60c to \$1 per cord stumpage, and will cost in labor from \$5.50 to \$7.50 per cord at the mill.

The protection of this large area is a very difficult problem, and almost every year areas in some parts of the Province are being burnt over. Within the last 12 years over two million acres was burnt or partly devastated by forest fires. Railway construction parties, engineering parties, and after them the locomotive, the surveyor's careless cook, the river-driver, the prospector, the pleasure-seeker, the careless lumberman, have all done their share in burning up our forest wealth.

The pulp industry, if fostered, will mean much to the railway companies in the way of freight, to the settler by creating a demand for his produce, to the laborer and to the people of Canada in general.

Some of you no doubt have seen the great pinery which occupied the region of the Great Lakes and of the Upper Mississippi. The forests of Michigan, Wisconsin and Minnesota originally, it is estimated, contained 350 billion feet B. M.; Michigan, 150; Wisconsin, 130, and Minnesota, 70. Lumbering began in Michigan and Wisconsin in the thirties, and was of small importance till the early seventies. Since then these pineries have become almost depleted. In 1892 it reached high-water mark, when eight and one-half bil-

lion feet was cut, more than half of what we have in Ontario to-day. It is further estimated that of the 350 billion, more than 60 billion was destroyed by fire. The rapid depletion of these forests leads one to believe that possibly our supply is not inexhaustible.

You frequently hear the remark that we burn up every year by forest fires as much pine and other merchantable timber as we cut. Fires sweep over large areas almost every few years and destroy not only the timber which is merchantable, but destroys also a crop of young growing pine and other timber which was to form the future forest, and which in 25 or 50 years would be worth millions of dollars. To this must be added the injury to the forest soil and the water sources. We have in this Province to-day over 30 million acres of just such land burnt or partly burnt over at different periods, non-agricultural, requiring no tree planting, thickly studded with a second growth of young spruce, Jack pine, tamarac, balsam, poplar, birch, and in some instances red and white pine, large areas having even now attained a growth of from 10 to 30 and 40 years, which require no further care than the protection from forest fires.

It may be a very difficult matter to protect these forests from fires, yet it is done in other countries, and why not in this. The conditions are not more unfavorable. It will cost annually more than is now being expended by the Government, but what of that, if it costs double or treble the amount, what is that compared to the revenue that might be derived later on from the annual growth from over so great an area. It will cost no small amount to protect our 40,000,000 acres of virgin forest, but the annual growth on this would amply justify any Government, in spending a much larger amount than has ever been spent heretofore. Why, if the annual growth of pulpwoods such as spruce, Jack pine and poplar was only one-half of one per cent., the annual increase would be nearly one and one-half million cords in the virgin forests alone, although it is estimated that a pulp forest will reproduce itself in less than 80 years. Our pulp forests have not as yet suffered very extensively from fires north of the height of land, though unfortunately the construction of new railways into that country has lessened the supply much more than has the axe.

I close this paper with these remarks.

The question of protecting our forests and the timber supply for the next generation is your concern.

You are bound by every patriotic obligation to leave this Province in as good a condition for your children after you as you found

it yourselves, abusing the idea that man goes over the earth leaving a desert behind him, and this can only be done by keeping our waste lands from the ravages of fire, and if we do this the middle of this century will see as much valuable timber on our waste lands as we have consumed in the last quarter of a century. On grounds of humanity, a country is just as bound to guard against devastating fires as it is to guard against epidemics, and whether we consider the permanent interests of the lumber trade, of the settler in our new country, of the labor employed, of the public revenue, or the country generally, we are forced to regard and protect our forests next to our homes, as these are our greatest heritage.

[This Association is not responsible, as a body, for the opinions expressed in its Papers by Authors.]

REINFORCED CONCRETE HIGHWAY BRIDGES AND CULVERTS.

BY OWEN M'KAY, O.L.S. AND C.E.

Having prepared plans and specifications and superintended the construction of five reinforced concrete highway bridges and culverts in the Township of Sandwich South, County of Essex, Ontario, during the year 1907, I submit the following paper referring to these structures, accompanied with plans and specifications, for the consideration of the members of this Association.

The abutments in all of these bridges were constructed of concrete masonry, without reinforcements, and the floor system where the clear spans were 8 feet, 10 feet and 14 feet consisted of a solid slab 8 inches thick in the middle and tapering to 6 inches at the sides, with the two ends resting on the abutments and reinforced with the Kahn Bar system of reinforcements, excepting the 14-foot span, which was changed to 10 inches in thickness in the middle and 8 inches at the sides.

In the two bridges, with clear span between abutments of twenty (20) feet and forty (40) feet, respectively, the floor slabs in each bridge are supported by four beams or girders built into the abutments, and both girders and floor slabs reinforced by the Kahn Bar system, as shown on plans and more particularly referred to as follows:

1st. Bridge over Pike Creek. Clear span between abutments, 40 feet; width of roadway between railings, 16 feet. The two outside beams or girders are 18 inches in width and 34 inches in depth from bottom of girder to top of floor, but in the two outside girders the concrete was built up to the height of three (3) feet above the floor and six inches in width, and suitably to form a mailing. The two inside girders are 20 inches by 36 inches. The length of girders and reinforced steel were made 42 feet to allow for overlapping 12 inches on the abutment, which latter was carried up between the girders and around them to the top of the floor, so as to make a continuous wall.

The steel reinforcements used in these girders were two $1\frac{1}{4}$ by $3\frac{3}{4}$ and 1 in. by 3 in. Kahn Bars, 42 feet long in the outside girders, and three bars $1\frac{1}{4}$ by $3\frac{3}{4}$, and two bars 1 in. by 3 in., 42 feet long, in each of the inside girders.

The bars used in the floor were $\frac{1}{2}$ in. by $1\frac{1}{2}$ in. by 16 ft. 6 in., spaced 12 in. apart with $\frac{1}{2}$ in. round rods placed between beams to provide against longitudinal strains.

This bridge, as well as the others referred to above, was designed to carry a 15-ton road roller, or 150 lb. live load uniformly distributed over the entire surface.

The concrete in the lower part of the abutment was composed of one part of Portland cement to six parts of gravel.

In the girders and floor, and one foot beneath, it was made of one part Portland cement to one-half part sand and four parts stone crushed to pass through a $\frac{3}{4}$ -inch ring, excepting the upper $1\frac{1}{2}$ inch of floor and exposed faces of beams and girders, which were faced with cement mortar in the proportions of one part cement to two parts of clean, sharp sand. The concrete was mixed by a concrete mixture, the girders, railing and back filling between and behind the girders being all completed in one day, and the floor slabs on the following day, in order that the completed bridge should conform as nearly as possible to a monolith.

Two months after the bridge was completed it was tested by passing over it a threshing machine engine weighing nine tons, coupled to a wagon carrying a water tank weighing about three tons.

This load passed over the bridge several times, with speeds increasing from about two miles to seven miles per hour, but we could not detect the slightest deflection or vibration in the bridge, and the effect of the load was not noticeable in any way.

The cost of this bridge was as follows: Abutments and wings, 66 3-10 cubic yards of concrete masonry in abutments and wings, at \$9 per cubic yard, \$596.70; 41 6-10 cubic yards in floor slabs, girders and railings, at \$9 per cubic yard, \$374.40; 7,143 lbs. of reinforced-Kahn Bars at $3\frac{1}{2}$ c per lb., \$250; engineering, superintendence and other incidental charges, \$95; total cost of bridge, \$1,316.10.

The above cost includes excavation, forms, removal of old bridges, etc.

Plan No. 2.—Bridge over Little River, Sandwich South. Clear span between abutments, 20 feet; width of roadway between railings, 16 feet. This bridge was built after the same design as the Pike Creek bridge above referred to, but the girders as shown on

plan were 12 in. by 22 in. and 16 in. by 24 in. for the outer and inner girders, respectively, and the railings were composed of 8-inch copings and gas pipes.

Plan No. 3.—Bridge over Sullivan Creek. Clear span 14 feet, and a roadway 18 feet in width. This bridge has concrete abutments and a reinforced slab floor resting directly on the abutments. The slab is 10 inches thick at the centre and nine inches at the sides, and the reinforcement consists of Kahn Bars $\frac{1}{2}$ in. by $1\frac{1}{2}$ in. and 16 ft. spaced 9 in. centres; it is designed for a 10-ton roller or 100 lbs. per foot. The remaining flat top culvert, 10 ft. and 8 ft. spans have floors 8 in. thick at the middle and tapering to 6 in. at the sides, with smaller sized bars.

The cost of the girder bridge over Little River was as follows: 44 cubic yards of concrete in abutments, including excavation and moulds, at \$7.50 per cubic yard, \$330; 15 cubic yards concrete in floor and beams, at \$9 per yard, \$135; gas pipe railings and copings, \$35; steel reinforcements, \$98; cost of construction, \$598; incidental costs, \$70; total cost, \$668.

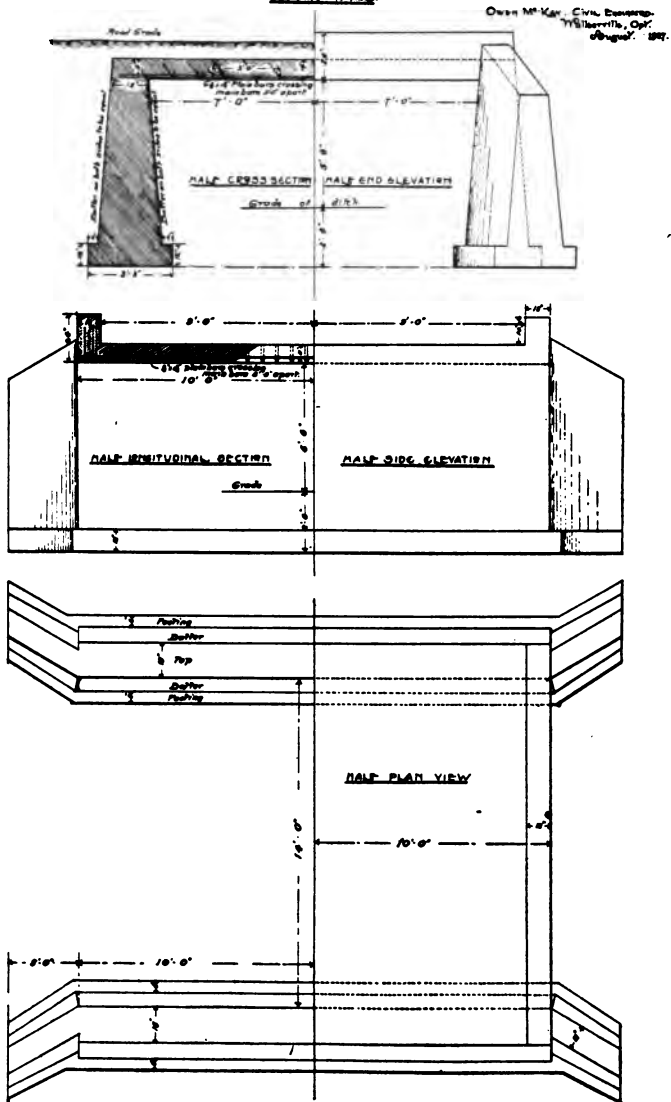
The cost of the slab floor culverts were as follows: Culvert, 14 ft. span, \$325; culvert, 10 ft. span, \$267.50; culvert, 8 ft. span, \$235.

With reference to the steel reinforcements, the Trussed Concrete Steel Company of Canada, head office, Toronto, furnished the plans of floor systems for each bridge, showing all necessary details with regard to the thickness of floor, the different sizes of the bars and rods, and the spacing of the same for the specified loads the bridge was intended to carry, and the engineer has only to check over the calculations to satisfy himself that the bridge will carry the designed load with safety.

It is well known that concrete masonry has great compression strength, but is weak in tension. As the lower portion of the concrete beam is subject to tension, the steel rod or bars should be of such design as will develop the full strength of the bar without slipping in the concrete, and it must also have sheer members attached to the bars to overcome the sheer and other internal stresses in the concrete due to the external loading.

The Kahn system of reinforcement, I believe, fulfils these conditions, as the diagonals are so distributed that they resist internal stresses, prevent slipping of the bars in the concrete, are rigidly attached to the main tension bars so that no riveting or placing of bolts is required in the field, and these diagonals are not in the way

Nº 3
PLAN
 OF
CONCRETE CULVERT.
 OVER
SULLIVAN CREEK
 ON
BASE LINE ROAD
 7th OF SANDWICH SOUTH, C. 22525X.07.
 — Scale 1/4" = 1 foot —



of tamping the concrete, and can be easily put in place by ordinary labor.

However, there are numerous other bars in the market for the engineer to choose from.

As many contractors and some engineers have the impression that iron rods or bars placed near the bottom of the concrete is all that is necessary, I beg to call their attention to a paper written by Mr. L. G. Robinson, C.E., in the December number of Applied Science, published by the University of Toronto Engineering Society, in which the requirements of steel reinforcements in concrete is treated in a comprehensive and very intelligent manner.

In conclusion, I am of the opinion that steel reinforced concrete bridges will in the near future not only replace the old wooden culverts and bridges, but will come into general use in bridges up to spans of 100 feet or more owing to their relatively low cost, simple construction, adaptability to all conditions of soil and locality, and their durability.

If due care is taken in construction, these bridges will last indefinitely, with no expense for repairs.

I have attached to this paper plans of the bridges and an extract from the general specifications.

EXTRACT FROM THE GENERAL SPECIFICATIONS FOR CONCRETE
BRIDGES IN THE TOWNSHIP OF SANDWICH SOUTH,
COUNTY OF ESSEX, ONTARIO.

All work must be done in workmanlike manner and in accordance with the plans and specifications furnished by the Township Engineer and to his entire satisfaction.

Anything omitted from the plans but which is necessary for the satisfactory completion of the work must be provided by the contractor without further charge.

The engineer shall be the sole judge of the meaning of the plans and specifications.

Excavation.—The contractor shall excavate the foundations to the depths and dimensions shown on plan and such further dimensions as will allow for the necessary curbing of the concrete work.

All masonry must be made of concrete. The floor and beams of bridge shall have the required cross-section and spacings shown on detailed plans.

The abutments and wings shall be made of concrete masonry composed of one part of American or Canadian Portland cement of approved brand, three parts of clean, sharp sand, and five parts of crushed stone. Gravel may be substituted for crushed stone in abutments, at the discretion of the engineer.

The upper one and one-half inches of floor shall consist of one part of Portland cement to two parts of clean, sharp sand, thoroughly mixed and applied before the remainder of the concrete work in floor shall have time to set.

The concrete in the body of the floor and beams shall consist of one part of cement to two parts of sand and four parts of crushed stone.

All exposed places of the bridge shall have a coating of cement mortar one inch thick, composed of one part of Portland cement to two parts of clean, sharp sand, which will be applied at the same time as the backing, and the whole rammed while fresh to insure a perfect bond.

Moulds for concrete shall be composed of two-inch plank dressed on the inner side and both edges to a uniform thickness, and shall be made stiff to prevent distortion during filling; moulds must be left on the masonry as long as may be required by the engineer.

Before laying the steel reinforcement, the forms shall be covered with a layer of cement mortar, one part of cement to three parts of fine gravel, on which the steel shall be laid as shown on detailed drawings, after which the concrete shall be immediately deposited and thoroughly tamped around to form a perfect bond.

The concrete shall be mixed in a medium wet condition.

The cement must be of the best quality of freshly ground brand of Portland cement, approved by the engineer.

Sand and gravel shall be clean, rather coarse, and free from vegetable mould or other hurtful matter, and shall be screened, if considered necessary, by the said engineer or inspector.

All broken stone must be made from clean, durable rock, and crushed so that it will pass through a two-inch ring and be rejected by $\frac{1}{4}$ -inch ring where used in abutments and wings; but the stone in floor and beams shall be broken to pass through a $\frac{3}{4}$ -inch ring. Within these limits the entire product of the crusher must be used.

The contractor must not make any alterations or changes in the work without the consent of the engineer in writing.

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CONCRETE IN MUNICIPAL BRIDGE WORK.

BY JAMES HUTCHEON, O.L.S., GUELPH.

Twenty years ago the use of Portland cement concrete was very limited in this Province. The manufacture of Portland cement in Canada was at that time still in the experimental stage. The cement then being used was imported from Europe, and being high in price, its use was confined chiefly to difficult foundation work, and to a limited extent in sidewalks and street pavements.

The use of cement concrete for sidewalk construction came rapidly into favor, because of its substantial appearance and durable qualities, compared with the materials then in use.

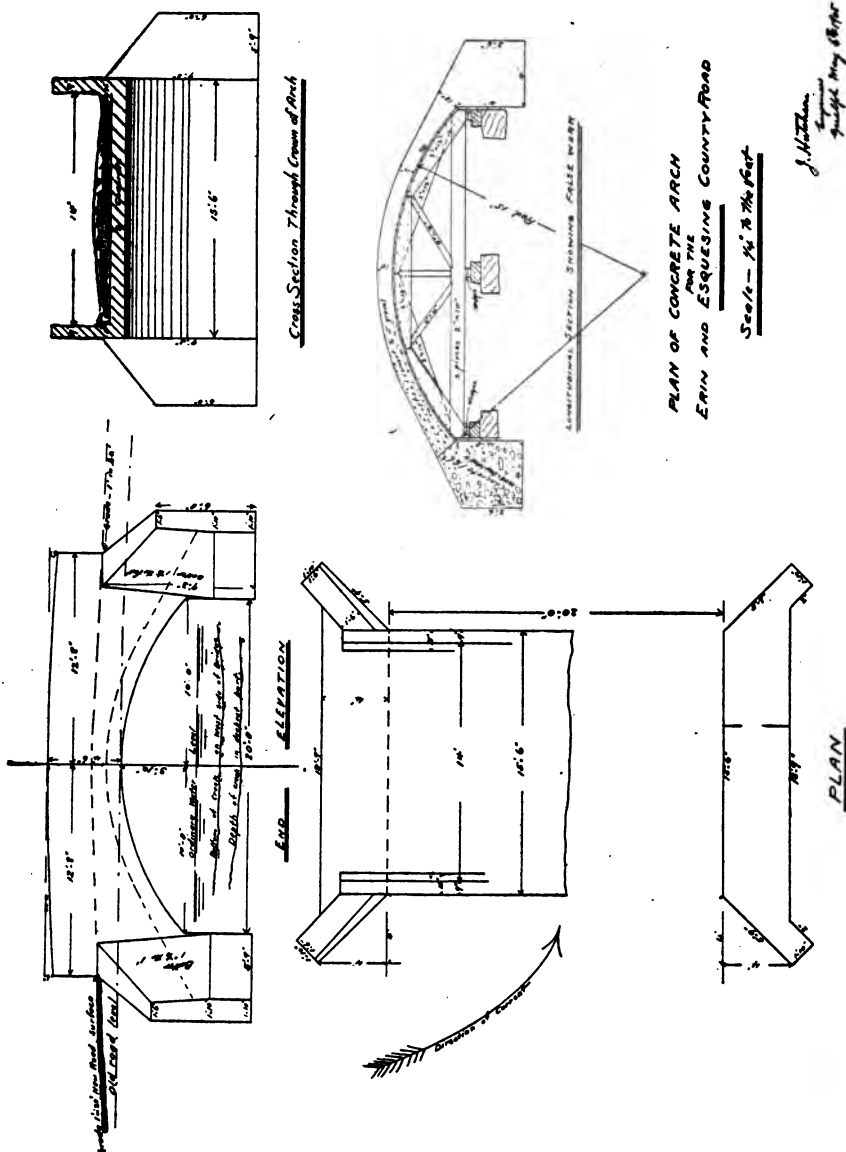
Though its value for that purpose was at once recognized, yet even ten years ago there were very few Municipal Councils who would consent to its use in bridge abutments, though some would permit it to be used in the foundations. To-day concrete has almost entirely displaced both stone and wood in the construction of abutments, short-span bridges, and culverts.

It is in almost universal use for foundations and in the basement walls of large buildings, and even in the cellar walls of low-cost buildings it occasionally takes the place of rubble masonry, while in the form of concrete blocks or of moulded artificial stone it has a recognized place among the ordinary building materials. But the widest field for expansion in the uses of concrete lies in its combination with steel in the form of reinforced concrete.

Rapid though the increase in the uses of concrete have been, the literature on the subject has kept pace with the growth, till every phase of this subject appears to be covered.

So much prominence is, however, given to the newer methods of construction with reinforced concrete, that we are apt to forget that plain concrete still has its uses, and perhaps think that if our designs do not provide for reinforcement they are not quite up to date.

The experimental knowledge of the action between steel and



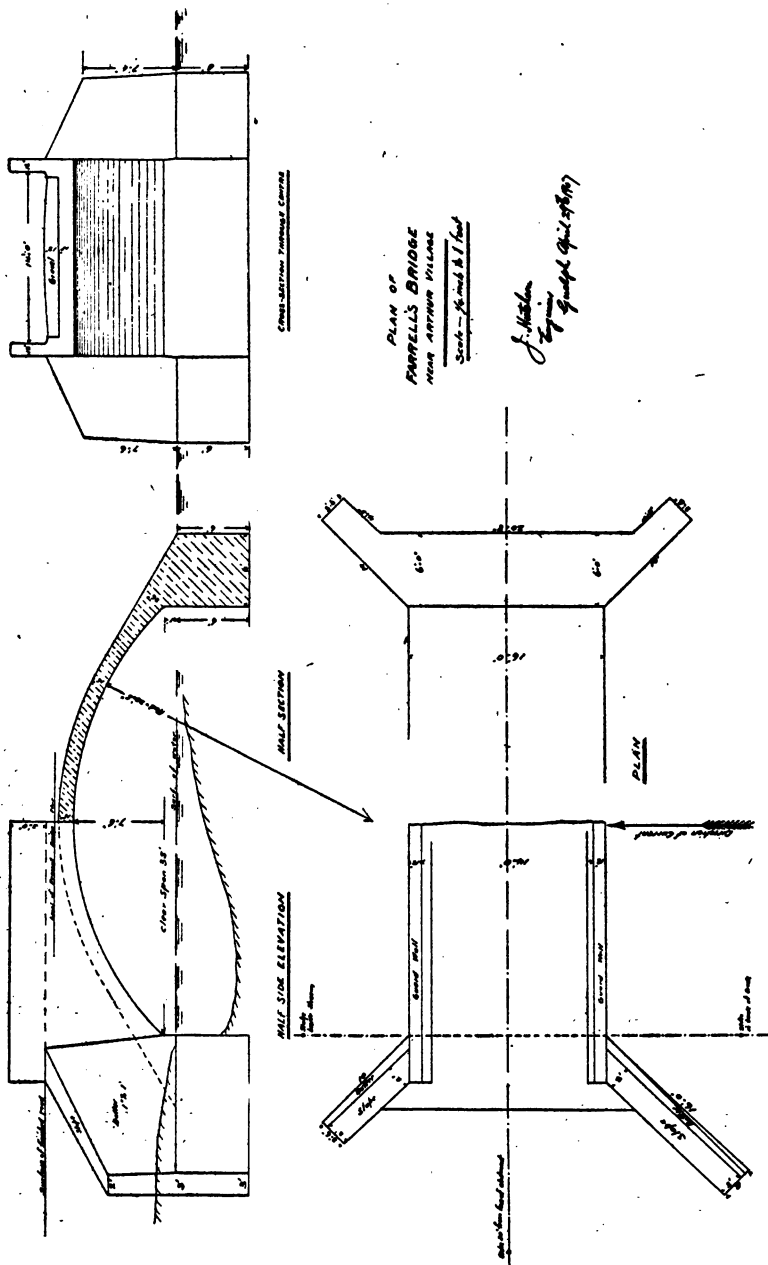
concrete is now so complete, and the experience with its use in construction so extended that its safety and durability are beyond question, when used with reasonable skill and intelligence. The want of this skill must for a time retard its use in municipal work, as the necessity for careful supervision of concrete work is not yet fully realized by the average Council.

The work, as a rule, is let to the lowest bidder, and often goes to an inexperienced contractor to be carried out, under the inspection of a Commissioner or a member of the Council without previous experience or knowledge of the work.

Limited in this way, the engineer, however much he may admire other styles of construction, will confine his designs in concrete to types within the capacity of those who are to carry out those designs. The plain concrete arch is without exception the best form of construction for culverts or short-span bridges under such conditions, and spans up to 30 or 40 feet in length can be built by local building contractors at prices which compete with steel bridges, when we take the cost of the abutments for the steel bridge into account, while the appearance and durability of the arch gives it a decided preference. The span length should be limited to something like the length named, as an increase in span much above the length mentioned necessitates more expensive false work and more difficult construction, with the increased danger of settlement during construction, so that where a greater length of bridge is required the length should be made up by increasing the number of spans rather than by increasing their length. In situations presenting no unusual difficulties in obtaining safe foundations, it will often be found that two short spans of, say, 20 feet each, can be built for less money than a single span of 40 feet, and at the same time give a bridge of more pleasing appearance. In fixing the proportions of the arch, we cannot do better than remember the old rule that the rise should not be less than one-sixth of the span, but in many cases the formation of the ground will admit of a greater rise than this, especially if the spring of the arch be kept near the low water surface.

If the arch is low and flat, its appearance will usually be improved by making it of the three-centre form, using short curves with a radius of four feet or thereabouts at the abutments.

In an arch bridge the opening or waterway may usually be considerably smaller than would be necessary for an iron bridge, and need not be much greater than the maximum flow of the stream, as even if the arch runs full, no damage is likely to result from floating ice or timber. As the wearing surface of the roadway above



the arch need be only a few inches in depth at the crown, there are very few places where this form of bridge cannot be used without much change in the grade of the road.

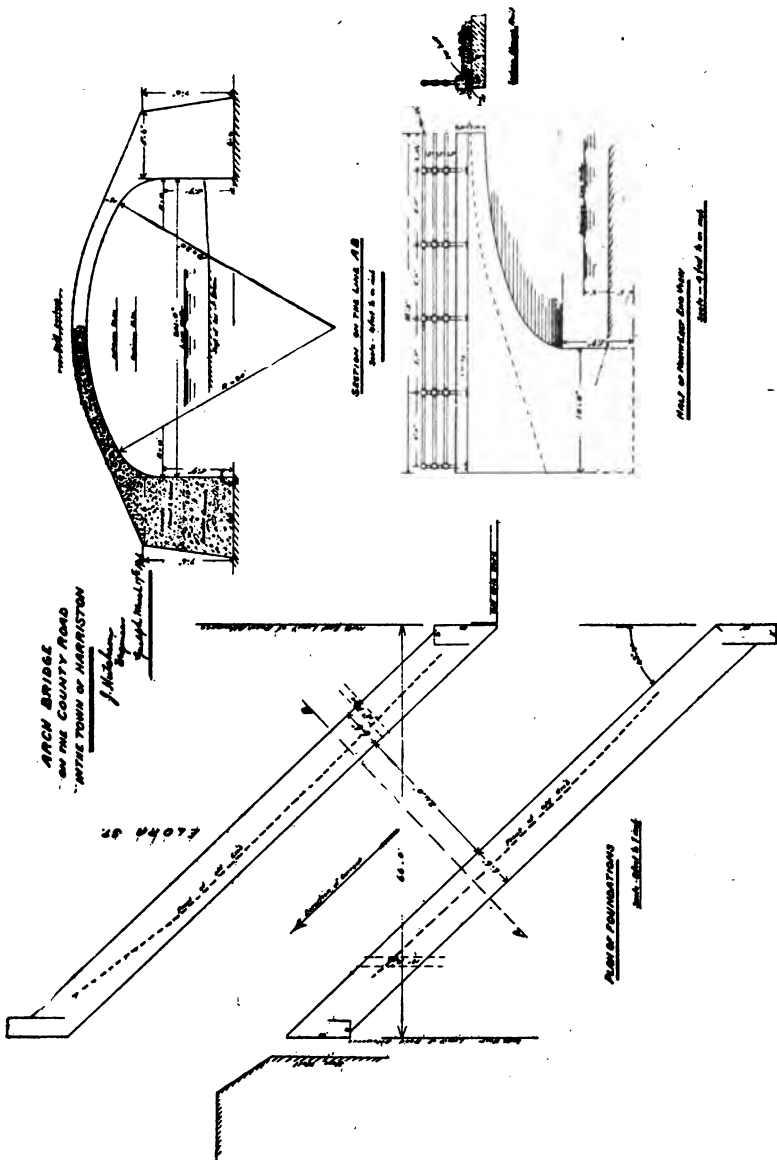
In the construction of the piers and abutments, the cost may be kept down without impairing the quality of the work by using boulder concrete. Below ground a 1 to 6 gravel concrete may have as much as fifty per cent. of the volume of the work made up of boulders. When so used the concrete should be mixed wet, so that the stones will bed themselves in it. Towards the spring of the arch the percentage of boulders should be reduced. In the arch ring a concrete of one part cement to five parts gravel has given good satisfaction.

If the gravel available for the work is fine or sandy, part of it should be replaced with broken stone. In a flat arch, a concrete of 1 cement, 2 sand and 4 broken stone is to be preferred. In the guard walls, a gravel concrete of 1 to 8 is sufficient. The thickness of the arch ring in short-span bridges is a question about which we have little available information. The writer a few years ago built a 20-foot arch, with a low rise and a thickness at the crown of 10 inches. A month after completion it carried a 15-ton roller. In several 35-foot spans the thickness has been made fifteen inches at the crown. It would therefore appear that within these span limits a thickness at the crown of one-half inch for each foot of span is safe practice for highway bridges. Whether this thickness may safely be reduced under our present methods of construction is a question for further trial.

DISCUSSION.

Mr. A. S. Code—I find very much information in this paper. I think concrete is a coming thing. Just the other day we noticed some proceedings against the Ohio Bridge ring; those men are in the "steel ring" business over there; they simply put prices up so high that it is a matter of necessity to think about concrete bridges. The sooner we get figures to show the comparative cost as to certain lengths, the better shape we will be in to meet the coming necessities.

In small bridges there is another design which would do away altogether with false work, which is a considerable item in the cost, a system of steel eye beams bent to the proper curve, and setting at the ends on the inverted channels to hold the ends in the ordinary design of bridge; then take No. 22 galvanized iron, corrugated and bent in a curved manner so as to slip in between the flanges on the



steel beams, and thereby do away with all false work. It is found that a man can jump on No. 22 iron bent in that shape without making any impression on it at all. When those things are slipped in on the flanges it does away with all the false work and you can put the concrete right on top.

Mr. Bowman—I was much pleased to hear the paper prepared by Mr. McKay, an old schoolmate of mine; twenty-five years ago we were across the way at the School of Science together, and I have not seen him very much since then, but he has had considerable experience in engineering in the western part of the Province. I am sure this paper will be appreciated by our Association. He deals with a comparatively new method of bridge construction, and I think he gave us some good advice when he said that plans should be prepared by those competent to do so in all reinforced concrete work of any dimensions. Of course, a small culvert is a very small matter, but when it gets up to a considerable span it needs an engineer's advice who has been making this a study. Of course he suggests that the companies will supply plans—the companies that make the reinforcing material—but you are rather at the mercy of the company if you resort to them, so that there is a field for engineers that make a specialty of reinforced concrete work. I see Mr. Connor has just come in, and that happens to be his line, and if any of our surveying friends have any reinforced concrete problems that they have to solve there are engineers in the field who will help them out without resorting to the companies. In that way they can get what Mr. Code seems to be anxious to have, a good competition in engineering work, and that is very much to be desired, so as not to be at the mercy of any contractor in any particular line. Reinforced concrete is bound in the future to compete with steel bridges where the foundations and the situations are suitable. Of course the steel bridge still has its field, but reinforced concrete will take a great deal of the work that heretofore went to the steel bridge companies.

Mr. McMullen—Mr. President, I noticed that Mr. Hutcheon's paper differed rather materially from the paper I have just read written by Mr. McKay, in the fact that Mr. McKay speaks of reinforced concrete almost entirely, while Mr. Hutcheon seems to be quite satisfied with the old style of non-reinforced concrete. Probably Mr. Hutcheon has some very good reason for building his 30 and 40-foot span bridges in that way; it may be more economical. Perhaps Mr. Hutcheon can tell us why he prefers the concrete not reinforced for his 30 and 40-foot span bridges.

Mr. Hutcheon—In my paper I refer to the method of carry-

ing out the work. Municipal Councils in our part of the country do not want to pay an engineer very much for supervising the construction; they get a plan and they want all that is in it, as a rule. A commissioner is generally appointed, the inspector and the engineer see the work under construction, or perhaps they do not; so that reinforced concrete cannot be carried out very satisfactorily under those conditions. Again, I think the plain concrete has the necessary strength and is probably cheaper.

Mr. McMullen—You figure then that the price of the extra concrete would pay for the extra superintendence that would be necessary for reinforced concrete?

Mr. Hutcheon—Yes. I don't know that I can compare costs with the costs given in the other paper. There is a ten-foot span which was built by the County of Wellington with guard and swing walls; it was built complete for \$210 a year ago.

Mr. McMullen—Mr. McKay gives \$267 for a ten-foot span culvert.

Mr. Hutcheon—There are other spans. Here is one built up near the Village of Hillsburg, but I haven't the price marked on it.

Mr. McMullen—I presume these would be about 16 feet long.

Mr. Hutcheon—Fourteen feet to your roadway—14 feet and then the wing walls—about 18 feet over all. Here is a blue print of one built in 1905, and the reported cost is \$1,900. That is a 35-foot span. The main cost in that was the foundations. The foundations are ten feet below the spring of the arch.

Mr. McMullen—You didn't pile in that case?

Mr. Hutcheon—No. Here is another one built about a couple of hundred yards from the other, with about the same span, and with a flatter arch; and the contract price of that, let a year ago, was \$1,056. It was all done by contract.

The President—We are very much indebted to Mr. Hutcheon for this explanation, and if there are any other gentlemen who wish to speak on these papers, we wish to give them an opportunity. Mr. Warren was very much interested in this matter; perhaps he will have something to say.

Mr. Warren—Mr. President and Gentlemen, I certainly appreciate these papers very much. There is some very good technical information given, and we ought to appreciate it very much, because these papers are given by members of our Association. We get the

most of this concrete information, or a great deal of it, from the States; we get some good things from there, but when we get it from our own country and our own men we ought to appreciate it the more. There is a paper called "Municipal Engineering," published in New York, and it gives a great deal of information regarding these things, practically on the same lines as given by Mr. Hutcheon and Mr. McKay in their papers, and we ought to be preparing ourselves for this concrete, because it is a coming article for building which we want to have in our country; it is going to supersede the steel for small culverts. Of course in our large spans of 100 feet or over they will build them of steel. I saw the plan of a bridge yesterday in the Public Works office, 90 odd feet of concrete, which is a very massive structure. There is no bridge that has a finer appearance than a cement or stone arch. I certainly appreciate these papers very much, and I thank the members for having given them to the Association.

Mr. Bowman—At the risk of being a little lengthy in my remarks, I would like to say one or two things on some of these plans. Surveyors, I think—I include myself as a surveyor—are apt to take anything they see in our Proceedings as something they can bank upon. There is just one little note of warning about some of these plans we may have reproduced, and that is, that the situation will have to be studied before they can be duplicated. The County of Wellington, which Mr. Hutcheon comes from, is pretty generally founded on the rock, and Mr. Hutcheon's plans no doubt have stood the test, or else he would not bring them here some years afterwards and show them to us; but if we are to take light concrete arches, similar to his plans, and put them on a foundation of quicksand or something equally unstable, we will probably find some fine morning they will be in the bottom of the creek. I don't think that would be quite as apt to happen with reinforced concrete, because the bars would permit of settlement to a certain extent; although they might be cracked, they would still remain in working order. In that way I think that reinforced concrete is considerably safer. In Mr. McKay's plan there is just one feature, looking at that for a few minutes, that I noticed, that I think there can be an improvement in, and that is in the concrete abutments. He says the abutments are not reinforced. The feature that I noticed was that he has a batter from both the back and front of these abutments. He tapers that up from the width he has taken from the bottom to a much narrower width at the top, and he puts a batter on both back and front. I believe that it is a mathematical mistake to batter the back. If any of you have seen Theodore Cooper's specifications for bridge abutments, you will have noticed

that he has the back plumb; but in order to get the same width at the top, he steps them in, and in that way, instead of having the back battered and the force applied so that it will push your abutment into the creek, you have the force applied horizontally; those steps help to keep the abutment erect instead of there being a tendency to push them over. I believe they are easier constructed if the contractor understands how to do so, with those horizontal steps at the back and have the back plumb, and then the weight down on those steps will keep your abutment up to a certain extent and there is no tendency to push them over. With the battered back there is the tendency to push them over.

Mr. Hutcheon—I may say in reference to the concrete plans I have submitted, that none of them are built on rock foundations. I don't know that I have ever built an arched span on a rock foundation. Those 35-foot spans are built on clay foundations.

Mr. Bowman—A good solid foundation?

Mr. Hutcheon—Good firm clay. In the paper I refer to a 20-foot span which I built and put a roller over a month afterwards, or perhaps less than a month; that was built in the City of Guelph. We had a road which was pretty low and we couldn't raise it, and I put in two 20-foot arches there and the double arch cost us about \$1,250. We had a good deal of difficulty with the foundations on that case; we had to keep a steam pump going all the time while we were putting in the foundation; I think we had a 16-foot roadway in that case, and about a four-foot cement sidewalk and concrete guard walls. The cost was lower than any of these I have submitted. It was done by day work. I hadn't a plan of it; I just made a pencil sketch; but it was a very flat arch.

Mr. Warren—Wouldn't an abutment battered on the back be more likely to stand a back thrust than one built with steps?

Mr. Bowman—Well, perhaps I can illustrate that better with chalk. (Makes rough diagram.) Take that as an illustration of the abutment with a little batter on the front; and then to get the necessary reduction in width they put considerable batter on the back. It seems to me the pressure of earth tends to push that over. Whereas, if you step it off in the back you have an abutment that the pressure of the earth tends to keep erect; and that is the method that Theodore Cooper has adopted altogether in his bridge abutments, and I think it is, mathematically, a better proposition than the other.

Mr. McMullen—Don't you think the element of friction there is the important feature of the step?

Mr. Bowman—You have the weight there.

Mr. McMullen—There is more friction against the earth bank with the steps than there would be with a battered abutment?

Mr. Bowman—I have not worked it out mathematically.

Mr. Ure—Mr. Bowman's criticism does not apply to bridges such as Mr. McKay's plans show. There are heavy, massive concrete beams between abutments which would make it impossible for pressure from behind to have any effect in the way of pushing them into the creek. That method is all right for steel bridges, but does not apply, I think, to such bridges as Mr. McKay has designed.

Then there is another thing that Mr. Code mentioned I would like to call attention to, that is doing away with false work by building concrete bridges with eye-beams and using corrugated iron slipped in between the flanges. I think that is a mistake. The bridge companies that furnish eye-beams and corrugated iron recommend that, but they are not interested in concrete bridges, they are interested in steel bridges. They are interested in selling steel, that is all. In the concrete bridge, if there is steel in it at all, I think the steel should be entirely embedded in concrete. If it is exposed at all, as this would be exposed—the under side of it would be exposed to moisture; it is never painted or looked after until it falls down—the rust is continually eating its way from the bottom upwards; and you will find it makes a very much stronger bridge, and you can use less steel if you build the concrete with the eye-beam embedded in it, with probably about two inches of concrete below the steel, and then build your floor on top of that.

There is another thing that we should be on our guard against, and that is the adopting of the plans furnished us by trust concrete and steel companies, and other companies who are interested in steel, and putting those plans into the hands of inexperienced men to build. It looks to be a very simple matter to place the steel according to those plans, but it is a very important matter that the steel should be properly placed, and placed by men who understand the reasons for placing it where it is; also very important that the concrete should be mixed in such a way that it will have a perfect bond with the steel. I have had some experience with that where inexperienced men would place probably inferior concrete, or concrete that was too dry—placing the steel carelessly and mixing the concrete carelessly and too

dry, so that the steel didn't hold in the concrete, and the result is, no matter how well the plans may be drawn, if the work is not carried out with accuracy and with some knowledge on the part of the overseer, failure will follow. Don't trust too much to the plans, but see that the plans are accurately carried out. If they are not the result will be a failure.

Mr. S. James—Unfortunately for me my hearing is not very good and I am not able to follow all that has been said. However, I can recognize a little of what has been said, and I would say this, with reference to those abutments, that that kind of work, whether it be concrete, brick or stone, or wood, or whatever it may be, I think there is too little attention paid to it by the parties constructing the bridge; whether the engineer omits to be present himself when the work is being proceeded with or not, I don't know, but this much I must say, that there has been, as a general rule, too little attention paid to the filling in of the earth behind the abutment. Very often the contractor, or whoever he is who is doing the work, is permitted to dump from a cart from the highway itself towards the abutment, just continuing that right up to the abutment without any regard to ramming in or levelling down. Now that is the greatest mistake possible. There is a large amount of strain that is lost by simply that process. The abutment may be as strong as you like, still there will be more or less pressure if it is allowed to be done in that way. That is my experience, and I have had some little, though not a very great deal.

Now I think in the construction of a bridge or culvert it is very important that the filling should be done properly, and that the engineer should give instructions to some one, if he is not present himself, to see that that is done, and that the levelling is proceeded with horizontally, or if anything, rather higher towards the abutment, than back from it, and kept that way right along up until the filling is complete. That is my opinion of the matter. I don't know how the other gentlemen may look upon it, but I certainly think that this is a very important feature in building abutments for bridges of that kind.

The President—These papers are very interesting to the profession, and the discussion is very valuable. I will gladly give an opportunity for anyone else to give us some information.

Mr. Connor—I think there is no doubt for the shorter span culverts that probably non-reinforced concrete may be all right, but where you get longer spans it would be quite impossible to rely on them, because if you get an eccentricity of load it will produce such severe strains in the bottom or top of your arch

that the concrete cannot be depended upon to carry it. It is my opinion, too, that concrete bridges should be as carefully designed, and stresses and everything calculated, just the same as if they were steel structures, because, although they may stand a certain time, you may get some day a condition of loading that will affect it, or it may stand the load a good many times and yet the last time it may go, through the gradual cracking of the concrete. The insurance against that is the use of steel. While I quite agree with the previous speakers that it should be very carefully placed, I would hardly think that the extra supervision required would offset the loss in strength by the omitting of the steel. It is possible to place steel without going into it so very carefully, and yet accomplish a great deal, and strengthen the structure very materially by the introduction of plain bars.

There is another little point which was mentioned and that is reinforcement of steel beams. I think that is uneconomical in every way, unless the beam was so shallow and the depth of the concrete so great that the steel is all kept down well below the neutral axis. In fact, the efficiency of the steel is directly in proportion to its distance from the neutral axis. Any steel you have near the neutral axis amounts to absolutely nothing. So that the steel, in order to be economical, should be kept as near the bottom of the slab as possible.

Mr. Hutcheon—In concrete steel beams I think the tendency is to have the reinforcement built in a factory so that it can be placed or held in place while the concrete is being put in. I think that the tendency in building beams now, instead of trusting to the inspector to see it is in place, is to have it fastened in place.

Mr. Connor—To a certain extent. It applies more, I think, to the slabs where they manufacture a fabric of the required strength that is simply placed and rolled out in position, but it cannot be done to the same extent in beams. The reinforcement is often built on the ground and that requires a certain amount of care. The Kahn bar in a measure satisfies that requirement, the flange, and so on, being ready and made to the proper size.

The President—I don't like to shut off discussion of such interesting papers as these, and if anyone else has anything he wishes to say we would give him a few moments, but time is passing, and we will have the benefit of the papers and the discussion in our Annual Report.

[This Association is not responsible, as a body, for the opinions expressed in its Papers by Authors.]

RIGHTS OF WAY.

BY WILLIAM ERNEST M'MULLEN, ST. JOHN, N.B.

In the year 1848 the first sod of the St. Andrews & Quebec Railway was turned, and after many vicissitudes the railway was opened for business about the year 1857. This was the first railway in New Brunswick, and, as its name implies, was projected to connect, for military as well as commercial purposes, the seaport of St. Andrews with the ancient City of Quebec. Perhaps those who encouraged the construction of this railway from a military standpoint had in mind the memorable march of the 104th Regiment on snowshoes during the winter of 1813-4, when they traversed the wilderness between Fredericton and Quebec in order to assist the Upper Canadian troops in defending the frontier. This St. Andrews & Quebec Railway was the nucleus of the Canadian Pacific system in New Brunswick. It never reached Quebec. In fact, for a number of years the northern terminus of the road was not far from the town of Woodstock, N.B., and subsequently became the New Brunswick & Canada Railway, which eventually consisted of a line between St. Andrews and Woodstock, a branch to St. Stephen, another eight miles long to Houlton, Maine, and another six miles long to Vanceboro, on the border. In the meantime other railways were being constructed in New Brunswick. A road from St. John into the State of Maine, under the elaborate title of "The European & North American Railway for Extension from St. John Westward," was opened in 1867. This road went into the hands of a receiver and afterwards became the St. John & Maine Railway. The Fredericton Branch Railway, a 22-mile line, was built in the late sixties between the City of Fredericton and the St. John main line. This line was operated until 1883 as a distinct railway, when it was taken over by the New Brunswick Railway. The latter was a line first constructed from Gibson, opposite Fredericton, to Aroostook County, Maine, eventually being continued to Presque Isle, Maine, and extended into Woodstock and north to Edmundston. In 1882 the New Brunswick Railway acquired the New Brunswick & Canada, and in 1883 the St. John &

Maine, and the Fredericton Branch. After operating these lines until 1887, the New Brunswick Railway Company leased them to the Canadian Pacific for a thousand years, less one. At the time when most of these lines were being located there was a railway hunger in the land. The land itself was worth so little without a railway that owners in many cases freely gave the right of way. In other cases the right to traverse properties with the railway track was verbally given, and in many cases at the present time, unless adverse possession can be shown, the right of way does not appear to extend beyond the ends of the sleepers. Some deeds of the right of way were obtained, but on most of the branch lines it seemed to be the exception rather than the rule when title was obtained in this way. On the Western Extension, however, as the St. John Main Line was commonly called, deeds were generally had when the line passed through settled territory, and after a lapse of about forty years, the writer, in making a right of way survey on these lines, was called upon to make their acquaintance. When the Canadian Pacific acquired the New Brunswick Railway System there were practically no reliable track or right of way data, such as profiles or plans showing railway lands and alignment. In the old days they seemed to scrape along without these things, but conditions are very different now. Competition is keen, and railways to be successful must be handled systematically in all their various departments. A railway spends money for power and looks for it again in haulage tolls. The expenditure of power depends upon grades, curves, distance, and physical condition of roadbed, so that where these items can be improved it will mean less power in proportion to the tonnage, and consequently more profits. It will be seen that in order to know exactly where we are in the matter of grades and alignment, and where we would be as regards right of way, etc., in the event of any changes, a survey to obtain such information was very necessary. Not only this, but in connection with maintenance work, information is being continually asked for which involves much time and many special trips unless it is properly compiled after a comprehensive survey. It was conditions such as these that recently called for a re-survey of New Brunswick lines. The general scheme of the survey was to make a centre line traverse and tie in, right of way fences, lot lines, parish and county boundaries, locate the properties of the various owners along the line, run rail levels, obtain approximately the original ground line, and note the dimensions of culverts, etc. Such a survey in New Brunswick involved many more difficulties than would be found in a similar survey in probably any of the Provinces to the west. There was never any comprehensive system of survey adopted by the Government.

The Province began to be settled after the British occupation of Canada in 1760, and twenty-three years later the few settlers already here were largely augmented by the arrival of the Loyalists from the revolted colonies. The Loyalists received land grants principally along the St. John River, and from that time to the present land obtained from the Crown has been in the form of grants of any convenient size and shape, being a subdivision of nothing but simply so much land surveyed and cut of the wilderness. Sometimes, of course, these grants consisted of very large blocks, which were subdivided into lots. For example, the soldiers who served in the 1812-14 campaign were granted land which was allotted to them in tiers of uniform lots, and occasionally a certain man and associates would be granted a large parcel, which would be divided into lots for the several grantees. But there are no such things as base lines and subdivisions as generally understood in the newer Provinces. Practically all lines, long or short, were run by the needle, and as might be expected, the compass is the universal instrument used for their re-survey. The nature and extent of my survey did not, as I am sure you will understand, warrant the spending of much time in tracing out lot lines, nevertheless in some cases where limits of the right of way and the proper tying in of my work depended upon determining them, I went to some trouble in doing so. Where party lines were marked by fences, and these checked with the lines on the original Crown Lands plans, they were usually accepted as the best evidence of the location of those lines. In a number of cases there were no fences, but original lines re-surveyed had been marked by blazes, and very frequently there was no trace whatever of an existing line. While the "Act" is silent as to method of re-survey, in laying down these lots upon paper, I adopted what I believed the only reasonable one of proportioning surplus or deficiency between known lines and running them on the course intended in the original survey as nearly as this could be determined. Sometimes this direction could be obtained from a line in the vicinity, which had been run in the original survey, but more often it was laid down from the astronomical course after allowing for the declination of the needle and the annual variation. The former, at present in the vicinity of St. John, is about $20^{\circ} 30'$ west, and the latter, until within the last few years, was considered to be about $3'$ per annum. At present the declination appears to be at its maximum, for there is no appreciable annual change.

The system of conveyancing in vogue in this Province gave me no little trouble in locating those portions of the right of way for which there were deeds. I do not know of one case in which these properties were located and described with reference to the lines of

an original grant. Rarely the parcels were described by metes and bounds, but very frequently the description was similar to the following:

CONVEYANCE FROM JAMES JONES TO THE E. & N. A. RAILWAY CO.

All and singular that certain lot, piece and parcel of land situate, lying and being in the parish of Petersville, in the County of Queens and Province of New Brunswick, and described as follows:

Bounded on the north-westerly side by the lands of one James Belyea, on the south-easterly side by the lands of one Thomas Trott, on the north-easterly side by the lands of the said James Jones, and on the south-westerly side by the lands of the said James Jones, the same being a piece of land ninety-nine feet in width, running in a north-westerly and south-easterly direction, the same being a part of the farm now occupied by James Jones and his wife Margaret, and along, across and over which the said the European & North American Railway Company for extension from St. John westward are now building and laying, or intend to build and lay, the railway of the said company, which is to extend from the City of St. John westward to the eastern boundary of the State of Maine.

The difficulties attendant upon the location of this property forty years after the description was written are too apparent to require further explanation. I usually looked up some aged resident who was familiar with the property owners in the locality at that time, or failing in this, I would then go to the Registry Office and endeavor to find a record of the grantor's deed. Quite likely the description here would be similar to the one in question in referring to contiguous owners for the bounds. Then the deeds of these owners would be referred to if they could be found. Sometimes people did not bother recording their deeds, and this would add to the difficulty. But in almost every case by enquiry or search the property was located. In the Registry Offices all conveyances are recorded under the names of Grantor and Grantees in alphabetical order. This is the only way in which they are recorded, there being no reference whatever to the original lot or grant, so that you would find the conveyance of John Smith's land in one parish indexed with John Smith's land in another. Registered plans would often have been of assistance in my survey, but these are remarkable by their absence. In the Registry Office for the City and County of St. John, where they have continuous records

for the last 120 years, there are about 100 plans. In a couple of other Registry Offices that have been in existence from 80 to 100 years, I could carry all the plans of both offices very comfortably under my arm. I think some of the finest people in Canada live in New Brunswick, but I wish some of the good old-timers had provided a little different system of surveys and records.

For the field work two box cars were fitted up. The one with bunks and a drawing table, and the other with a dining table, stove, and quarters for the cook. The party, besides myself, was composed of a transitman and two picketmen, a draughtsman, a leveller and rodman, and three chainmen who went ahead and paint-marked one rail every hundred feet. These last could cover eight or nine miles a day without much trouble, and after getting their work well ahead of the party, were recalled to locate right of way, fences, culverts, etc. The leveller would cover about four and a half miles per day, and when he got too far ahead of the transit was recalled and ran a spare transit for a while. The transitman was paid \$75 per month and draughtsman the same; leveller, \$60, and the others, most of them engineering students, \$1.35 per day. The cook got \$40 per month. The average progress of the field work was a little over two miles a day, and the average cost of the field work, exclusive of car furnishings and inclusive of wages and board, was \$14 per mile. The cost of fitting up the cars with stoves, bunks, blankets, mattresses, tables, dishes, etc., amounted to about \$150. I was unable to obtain a draughtsman when the party first started out, and when I did he was never able to overtake the field work. This was the source of more or less trouble, and in prosecuting work of this kind again I would see to it that the drawing went along with the transit work, even if the plan had to be started in the middle of the survey. I found also that what seems easy and matter of course to a man who has seen a great deal of service in the field, is not always so apparent to an engineering student. These young men are excellent in many ways, and much the better men for their training so far as it has gone, but we sometimes forget that they are yet schoolboys, and look too soon for ripened fruit.

In commencing the track traverse the instrument was plumbed over the zero of the chainage with the telescope directed to the pole. Readings were then taken to each hundred-foot station in succession, and finally to the foresight or turning point. These turns on curves were usually taken about every 500 feet, and from end to end of tangents. The following is the manner of entering the notes in the field books:

Station	B. S.	I. S.	F. S.	Course	Remarks
2324 + 50.5	2320 + 09.3	2325 + 00 26 + 00 27 + 00 28 + 00		S. 6° 14' E. N. 5° 10' W. N. 2° 15' W. N. 0° 32' E. N. 3° 25' E.	
2329 + 00	2324 + 50.5		29 + 00	N. 6° 30' E. S. 6° 30' W.	

Observations for meridian were taken usually at intervals of two to five miles. Most of these were solar, but a number were also taken of the Pole star. The method adopted in observing the sun was as follows: The transit was set at one end of a tangent and sighted to a station at the other, the horizontal limb reading zero. The telescope having previously been levelled, and the index error (if any) noted, it is now directed towards the sun's easterly and lower limb if it be forenoon, or the easterly and upper limb if it be afternoon. After reading both horizontal and vertical limbs, the vertical arc and the lower horizontal plate are set free, the telescope plunged and revolved horizontally 180 degrees, and the first operation repeated. The following is the field book entry and record of the calculation. Latitude and longitude were obtained by scaling from an eight mile to the inch map.

FIELD NOTES

HOULTON BRANCH

JULY 13TH, 1907

Obs.	Atlan. Std. Time	Limbs	Horizontal	Vertical	Station to Station
A.	3.14 P.	U. E.	159° 14' R.	49° 59'	41 50
B.	3.21 P.	U. E.	320° 18' 30" - A.	48° 59'	

CALCULATION.

21° 56' 31" = Decln. at Noon
 0° 00' 54" = Corr. for time of obs.

(a) 21 55 37 Decln. at time of obs.
 68 4 23 Polar distance.

49° 59' 00" = Obs. alt.
 49 Refrn.

49° 58' 11"
 6 Parallax

cipede loaded with the transit, a small lantern with a reflector in it, and a few candles. It is better to have an assistant hold the lantern for you, but if necessary he can be dispensed with. Coming to the beginning of a tangent, a candle is lighted and set on the rail, then proceeding to the far end of the tangent the transit is plumbed over the rail and sighted to the lighted candle. No care was taken to observe the star at any particular time, such as at the elongation. With an ordinary watch and the ample means along a railway of checking it, there is no difficulty in reading the time of an observation to a half minute, and the greatest error which can occur through the noting of the time is at the rate of half a minute of arc per minute of time, and becoming less the more distant the star is from the meridian.

The following are the field notes and calculation in connection with an observation of the Pole star:

Obs. Polaris June 11-12, 1907, between Welsford and Grand Bay.

	Mean Std.	Defln.	Lat.	Location.
1.	8.57 p.m. 9.00 p.m.	$58^{\circ} 4' R$ } $58^{\circ} 6' R$ }	$45^{\circ} 25'$	Tan E. of Bayard.
2.	9.54½ 9.59	$24^{\circ} 44' R$ } $24^{\circ} 42\frac{1}{2}' R$ }	$45^{\circ} 23'$	Blagdon.

CALCULATION.—OBS. NO. 2.

9^h 56^m 45^s mean of obs. times
— 25 30 difference between 60th Mer. and M. S. T.

9 31 15 mean time of obs.
8 8 29 transit of Polaris M. S. T.

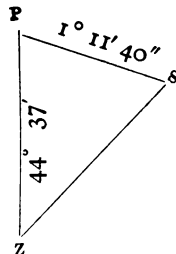
1 22 46
82^m 46^s ÷ 4 = $20^{\circ} 41' 30'' = P$
½ P = $10^{\circ} 20' 45''$

Cos $21^{\circ} 42' 40'' = 9.968044$

Cos $22^{\circ} 54' 20'' = 9.964329$

Cot $10^{\circ} 20' 45'' = 10.738601$

$10.742316 = \tan 79^{\circ} 44' 30''$



$$\sin 21^{\circ} 42' 40'' = 9.568010$$

$$\sin 22^{\circ} 54' 20'' = 9.590188$$

$$\cot 10^{\circ} 20' 45'' = \frac{9.977822}{10.738601}$$

$$10.716423 = \tan 79^{\circ} 7' 30''$$

$$\frac{24^{\circ} 43' 15''}{37''} \text{ mean defln.}$$

$$\text{N. } 24^{\circ} 6' 15'' \text{ W.}$$

$$44^{\circ} 37' = \text{co-lat}$$

$$+ 1^{\circ} 11' 40''$$

$$45^{\circ} 48' 40''$$

$$22^{\circ} 54' 20''$$

$$44^{\circ} 37'$$

$$- 1^{\circ} 11' 40''$$

$$43^{\circ} 25' 20''$$

$$21^{\circ} 42' 40''$$

Formula

$$\tan \frac{1}{2} (s+z) = \frac{\cot \frac{1}{2} P \cos \frac{1}{2} (a-b)}{\cos \frac{1}{2} (a+b)}$$

$$\tan \frac{1}{2} (s-z) = \frac{\cot \frac{1}{2} P \sin \frac{1}{2} (a-b)}{\sin \frac{1}{2} (a+b)}$$

The method of plotting by tangents was adopted and proved satisfactory as regards accuracy and speed. Many favor using latitudes and departures, and certainly there is no better method as regards accuracy, but I do not consider it quite so speedy as the former. In using latitudes and departures with odd distances it will be best to use tables of logarithms and logarithmic cosines and sines. I find these tables preferable to ordinary latitude and departure tables even when the latter are taken out to minutes. The matter of obtaining the degree of curvature B.C. and E.C. is an office job, and often a tedious one, becoming very complicated in the cases of compound and reverse curves. Where the curves were short, however, and the P.I. fell within the right of way, they were run to intersection and the external measured. By reference to a table of the elements of a one-degree curve the curvature and tangent distances can be at once obtained with very few figures.

In conclusion, I would say that my little party were very comfortable in their house on wheels, and so far as the table was concerned, we lacked none of the ordinary requirements of civilized man. I contrast our favorable circumstances in these respects with my memory of the first bush survey—not an unpleasant memory by any means—in which we had to carry everything on the outside before we could wear it within us. A little incident in the matter of obtaining provisions, which may be of value to members of the profession and others, concludes this paper. Fresh beef and mutton was to be had without difficulty, but after a time certain members of the party sighed for a change, and looked with covetous

eyes upon the hens which gathered their food beside our cars. Negotiations were opened with their owner without success, the hens were laying and were not for sale. When evening came the river was tried for fish, with no luck, and in a moment of abstraction, or something else, the fisherman left his baited line hanging out of the car window. The rest of the circumstances are very sad—for the parties concerned—but it is necessary to relate them in order to complete the story. The worm—and incidentally the hook—was swallowed by a thoughtless hen. Now, the men of the party were humane if anything, and after a brief consultation it was decided that an operation for the alienation of the hook must be performed in order to relieve the unfortunate fowl of that indigestible barb. The decision was carried into effect without delay, the principal instrument in the surgical operation being the ubiquitous survey axe. Unfortunately, from the standpoint of the hen, the operation was not a success, and she lost the number of her mess. Next day at noon she was accorded a decent, and, for a hen, a very fitting burial, at which most of the party were present and took an active part.

DISCUSSION.

Mr. D. D. James—I did not quite understand Mr. McMullen's explanation as to the method he followed in the reading of the instrument.

Mr. McMullen—The instrument is set at 24, for brief, and back-sighted at station 20. I find the course to be south 6 degrees, 14 minutes east, astronomically; my telescope is revolved and I sight the next station from it; the reading of the instrument is north 5 degrees, ten minutes west. My instrument is always reading the astronomical course. I find that to start with and I set the graduation of my instrument to read that course. When I am on the course north 5 degrees, ten minutes west, my instrument is reading 5 degrees, 10 minutes to the left.

Mr. James—How is the instrument graduated?

Mr. McMullen—From zero around to 180 degrees; but I don't think you would have any trouble operating that, no matter what the graduation was. It is exceedingly useful, because your instrument is always on the astronomical course, and it is very handy in plotting.

Mr. James—I find in reading the astronomical course or compass course that when one gets a course near 90°, say 85°, and gets another course 85°, altering the direction from east to west, or south-east to south-west, you are very likely to book that south-east, too, not noticing the change from the direction

east to west, and in consequence of that I like to have a compass graduate from 0 to 360, and simply read all my courses on the instrument from it; and if I want to have north-east and south-west afterwards, I can convert them, otherwise I have the continuous reading. Whenever the letters are mixed, personally I make mistakes that way.

Mr. McMullen—That is a thing one must be careful about. There is danger of making an error, but where the courses are put down in this way, running no greater than 90° it is much more convenient for plotting.

Mr. James—That is the tangent method—plotting by the tangent of the angle?

Mr. McMullen—Yes. I might have 20 or 30 courses I would like to lay off, I would establish a long meridian and then take a base of 10 inches or any multiple of ten, then take my table of natural tangents and lay off all these various tangents, and then by joining these parts of the lines which are parallel to my courses it is an exceedingly quick method of plotting, and very accurate.

Mr. James—I may say I have done quite a bit of right of way work on a plan of that sort, and with the money and time that are usually at the disposal of a person in that situation, I have found that plotting the course with a large protractor suggests itself to me as the easiest way; and for the accuracy of it completely within bounds, the way I like best is to draw a straight line from end to end of the roll of tracing cloth and lay a protractor on there, one of these 14 inch protractors, having it distinctly marked for the degrees on itself in Indian ink; mark the courses from 0 to 360 just as they are noted in the book and then from this long line, whatever course you make it, along the course of the tracing cloth, you can put this protractor on wherever you are working and make it read a course on that line, and then take off any bearing you like.

The President—I suppose you use a parallel rule?

Mr. James—Yes; a parallel rule or square; sometimes one is more convenient than the other.

Mr. Walker—I have listened to this very instructive paper of Mr. McMullen's with a great deal of interest, the more so as I have been engaged myself personally during the past year in exactly similar work on the Ontario Division of the Ontario & Quebec Railway. Mr. McMullen and myself, I suppose, received similar instructions, and we have both been engaged in the same kind of work. There is one thing I should like to ask him. Of course there were no special instructions issued by the chief engineer

regarding the method of making field notes, and I didn't follow the method suggested by him. Might I ask him (referring to diagram), does that represent an angle in the line of one degree? Does that represent a bend in the line?

Mr. McMullen—It does. That is my intention, to illustrate the beginning of a curve. My intention was to show this as the tangent between station 20 and 24, and then you are starting off on a curve.

Mr. Walker—The method adopted by me was usually to run the curves to intersection, measure the external and, if necessary, the intermediate points in order to arrive at the curvature. The point I wanted to mention was in regard to the convergence of the meridian. I took observations similar to Mr. McMullen's about every five miles, and of course the variation of the meridians on an east and west line is considerable. I had a line about 30 miles long, a straight line, and of course in placing a bearing on that line it would have to be referred to some particular meridian. The method I adopted was to take a meridian about the centre of the section; that is, when surveying between here and London. I took a meridian about Guelph Junction, and reduced all my bearings to that meridian, as I considered otherwise we would have to put on a different bearing on the line about every half-mile or so. So that in my work I state on my plan that all bearings are reduced to what was really the 80th meridian.

I don't know that there is anything else I have to say in regard to this matter. We were fitted up similar to Mr. McMullen with cars, and although we didn't have any adventures with chickens, still we had a very pleasant time indeed, and not long hours.

All my observations I took at night on the star. We usually took them at each station we stopped at; and it occurred to me in that way we were able, perhaps, to do a little more work than by stopping in the middle of the day to take an observation.

Mr. McMullen—I am rather glad Mr. Walker mentioned that matter about the convergence of the meridians. I found a little difficulty; although down in our country we don't have the long tangents you do in Ontario. Sometimes we would have a tangent a mile long, but very rarely.

I may say after going over a certain section of the line I found a discrepancy between the angles which had been carried on and my observations. With a transit out on a line an observation of the sun is only going to be a matter of compara-

tively few minutes, and I could take quite a large number of observations in one day by going along myself and just observing the sun in that way, and I found the observation of the sun very satisfactory.

The President—I think it is a very good idea to do what Mr. Walker did, in referring his courses to a certain point, for instance, about midway, at Guelph Junction; then anyone taking up his plan afterwards would be able to calculate accurately.

Where I was working last summer I was running out block lines, and they ran east and west for 18 miles, and all the lines are noted west because I changed the angle sufficiently at each six-mile corner, so that at the centre of each six-mile block the line would be due north and south, so that the course will refer to the centre of meridian. That is according to the Dominion system of survey.

Mr. Jones—I think the bearings should be made to agree with the local surveys. In Western Ontario Mr. Chalmers and I were associated in a right of way survey about 200 miles long from Port Arthur, and we allowed discrepancy of angle and convergence of meridian to be lumped together in evening up our bearings right through the country, so that each bearing was a true astronomical bearing as far as we could tell for that section of country.

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CITY AND TOWN LOTS.

BY S. BRAY, CHIEF SURVEYOR, DEPARTMENT OF INDIAN AFFAIRS,
OTTAWA, ONT.

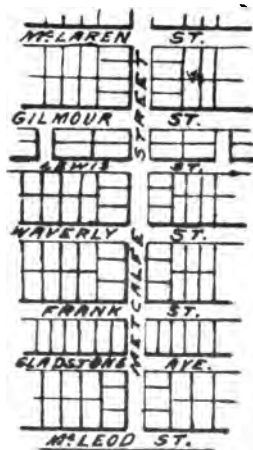
By a Provincial Act passed about fifteen years ago it was provided that no Municipal Council, except the Council of a city or town, shall lay out any roads or streets more than 100 nor less than 66 feet in width, except where an existing road or street is widened, or unless by the permission of the Council of the County in which the municipality is situate; but any road when altered may be of the same width as formerly. And it further enacts that no highway or street of a less width than 66 feet shall be laid out by any owner of land without the consent of the Council of the municipality, by a three-fourths vote of the members thereof. This enactment has proved to be a very wise one.

No action appears to have been taken to regulate the depths of lots. This would appear to be a matter of great importance, both from an economical standpoint and on account of the public health. If lots are laid out with a depth so small that the back yards, where houses are built, are continually in the shade, the general health of the residents will certainly be more or less affected. And again, if the lots are laid out of too small a depth, the city or town in which they are situated has too great a proportion of street area to maintain for the amount of assessable land area. This point may be especially illustrated in the sketch below.

This sketch shows a portion of Metcalf Street, in the City of Ottawa, and I may say there are parts of the said city similarly laid out. Between Gladstone Avenue and Frank Street, as shown on the said sketch, there is a depth of only one lot. I may here say that the very great majority of lots in the city are only 99 feet in depth, and this is a depth very commonly adopted in many cities and towns. Again, between Lewis Street and Gilmour Street there is a similar depth of only 99 feet. In both of these cases the houses in many instances front on one street and their back

yards are on the other. It is evident that the city has to construct and maintain two streets where one would be ample, and in addition to this has not only less land to assess, but on account of the fronts of the opposite lots facing on back yards, they are necessarily depreciated in value.

It may be contended that this is a state of affairs that should have been attended to by some proper officer of the municipality, who should have refused to accept the subdivision. This does not appear to be the duty of any officer. The lands were laid out, the plans filed, and the lots sold, and the city saddled with an extra street, and a large number of lots unduly diminished in assessable value.



Scale. 10 chains = 1 in. ch.

It is also to be noted that when a city has progressed with ordinary success, that a store 99 feet in depth is very shallow. In fact, the building cannot be built with this depth, as it is necessary to keep back from the rear line a sufficient distance to admit light at the back of the building. I think it should be admitted that 99 feet is too shallow a depth for a city or a town lot. It would, in my opinion, be a wise measure to have an Act passed limiting the depth of a block, that is to say, from one side to another in both directions, to 250 feet, thus making the lots 125 feet deep; of course subject to variation where the shape of the land or the inequality of its surface requires it.

In this connection it would evidently be also a move in the right direction if all subdivisions of lands in city, town or village lots for sale were submitted to a proper officer of the municipality for examination, he could then suggest amendments and finally approve or reject the subdivision, as the case may be. This duty could be well performed by the County Surveyor or by the City or Town Engineer, according to the location of the land.

I may be allowed to digress a little in this matter with regard to admission of sunlight. I believe it is admitted by all medical men that sunlight is essential to good health, and consequently to success in every undertaking, yet we are beginning to permit the erection of enormously high buildings in our cities which effectually prevent the sun from shining on the streets, except for a very limited time. The stores on the ground floor are necessarily always in gloom, and business has to be transacted with artificial light. It appears to be also doubtful whether my neighbor, on the opposite side of the street, has an equitable right to erect a building so as to place my offices continually in shade and gloom and compel me to the extra expense of artificial light. It is also to be remembered that if enormously high buildings are erected on both sides of the street a draft will be prevalent through the street that at times will be almost unbearable. I have been informed that there is a by-law in the City of London, England, that no building shall be erected with a height greater than the width of the street in front of it. Of course, if the owner wishes to add to the height of his building, he can place it back from the edge of the street the distance he wishes to add to its height. I think it would be greatly to the benefit of the whole Province if this matter were dealt with by the Legislature and an Act passed similar to the London by-law, limiting heights of buildings. It would thus be out of the power of any city to grant a permit under any circumstances to construct a building so high that injury would result directly and indirectly to individuals and to the public generally.

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PRELIMINARY LOCATION IN THE BUSH.

BY ROBERT LAIRD, HAILEYBURY, ONT.

An assistant locating in the extreme north, though hardworking, honest, ingenious, painstaking and unusually "bush-wise," was surely gaining the reputation of being a slow-coach with the head office, because he did not know and did not think out a very simple wrinkle connected with his work.

His ingenuity was sadly misused, and all because he had not conceived the idea that it was, and is, possible to run in a curve on the ground without establishing a single transit-point upon the curve itself; he had a firm conviction that his transitman must of necessity set the transit on the curve—preferably at the P. C., or if not there, then at the P. T.—in the case of a compound curve; he regarded the P. C. C. as a point from which he could no more escape than we all can escape the confidences of our friends.

This obsession led to disaster in the country in which he was working; primeval forest lands, with brooks and small lakes a plenty, and high, rocky hills with precipitous faces the common feature.

When his P. C., P. T. or P. C. C. fell within the margins of a lake, in the midst of a stream, or on a nearly vertical rocky wall, as was the case more often than otherwise, he described this as "——— hard luck" and proceeded to bridge the stream with heavy timbers, to drive long plugs for the transit legs in marshes and lake margins, or to erect platforms at rocky faces; establish thereon with care his P. C., set the transit over it, and proceed to another point on the curve—which, being out of sight because of the trees, might or might not prove suitable for a transit-point, and this was not disclosed until a line had been cut out thereto and chained; if not suitable, the building operation was repeated or the line abandoned and a second try made for another and more desirable point.

All this is easily avoidable by a much more elastic method

than that of laying down a curve by its chords, i.e., by short or semi-tangents to the curve. This method—as far as I am aware—has not been amplified by any field-book writer; perhaps it has been considered too obvious and simple to merit description; but that case in point—the bridge-building person of my experience—seems to warrant a short statement regarding it.

Had he been asked to run in a curve of 10 degrees deflection, he would not have hesitated to disregard the P. C. as a transit-point, but would have measured along the tangent produced the sub-tangential distance corresponding to the degree of curvature desired, there set his transit, turned the 10 degrees, laid down the remaining sub-tangent—which is also the leaving tangent from the curve—made proper correction for chainage, and gone gaily on; but 50 degrees of curvature was to him quite a different matter.

If the first 10 degrees of a curve can be so laid down, so can the following ten, or any other number of degrees.

The leaving tangent of the first part is then the entering tangent of the second part, and for every distance along this tangent there is a corresponding angle of deflection just as truly as there was for any entering sub-tangential length; and this is true for the third or any following part.

Now, to suggest the elasticity of this method. There is no good reason for selecting a certain length of tangent or a certain number of degrees of deflection; the proper considerations which determine these are as follows:

1. Any distance along the tangent to the curve, beyond the P. C., whose abscissa distance from that curve is not too great for the convenient and fairly accurate offsetting of stakes, and such that the leveller may easily observe the elevations of the corresponding points on curve, notwithstanding the obstruction to view by trees, vegetation, etc.

2. That the point be so chosen that a good foresight from it may be had.

3. That it be suitable for a transit point.

Suppose, then, we desire to lay out a 3° curve through an angle of 50 degrees to the left of a given tangent, the P. C. of which is L. 320+57; this hub is set, if possible, and the tangent is produced to any distance at the discretion of the picketman; this distance for a 3° curve should not exceed 350 feet.

The chainmen are furnished with a table of offsets, at five-foot intervals, of tangential length; they offset, if required, to the left

L. 321, the offset for 45 feet; L. 322, that for 145 feet, etc., etc. (Should they mislay this table, they are permitted to use the approximate formula $x = \frac{7}{8} n^2 D$.)

In the meantime the transit is moved forward and set up at the end of the line. Suppose the chainage of this hub is found to be $323+62.1$, being a tangential length of $323+62.1 - 320+57 = 305.1$ feet; the angle corresponding is $18^\circ.09'$ and length of arc 605 feet.

This angle is turned to the left, and the picketman instructed to cut not less than 350 feet and not more than 650.

The chainage of the point on curve, ahead of the transit, where this tangent touches is: Chainage of P. C. plus the arc $320+57 + 6+05 = 326+62$; the chainage of the transit point back of that curve point, and reckoning from it, is the chainage of that curve point minus the tangential length $326+62 - 3+05.1 = 323+56.9$. (The correction for chainage is made at the transit point for simplicity.)

With this chainage the men go ahead; offsetting station L. 324, offset for 260 feet; L. 325, that for 160 feet; L. 327, that for 40 feet, etc., etc., as before.

The chainage at the end of this line is found to be $329+72.8$, then tangential length is $329+72.8 - 326+62 = 310.8$ feet.

Corresponding angle is $18^\circ.29'$ and arc is 616.1 feet.

This angle is turned and the chainage correction made as before.

The new point on curve is $326+62 + 6+16.1 = 332+78.1$.

Now, total angle turned is $18^\circ.09' + 18^\circ.29' = 36^\circ.38'$, leaving $58^\circ - 36^\circ.38' = 21^\circ.22'$ still to be run; the corresponding tangential length is 223.8 feet and arc is 445.6 feet.

The instruction to the picketman, at the second transit point, was, cut the line 310 feet to the curve point and 223.8 feet beyond it or to chainage $332+78.1 + 2+23.8 = 335+01.9$.

This hub is then set correctly and the completing angle there turned. It will be noted that this hub must fall on the sub-tangent to the curve, or on the tangent passing through the P. C. C. when the curve is compounded.

Chainage is again corrected and the P. T. hub set 223.8 feet ahead of the transit point, thus completing the curve at station $332+78.1 + 4+45.6 = 337+23.7$.

In the case of a compound curve the process is continued by

turning off from this leaving tangent of the first branch, the angle corresponding to the distance beyond the P. C. C., proper for the second branch. (If a 1° curve, and tangent 322 feet: then the angle $6^\circ.26'$.)

The form of field notes is shown below:

P. T.	L.	$3 \div 67$		
		3		
T. P.		$1 > \frac{2}{0 \div 45.7 = \div 45.0}$	$6^\circ 26'$	643.3
	(322.0)	340		
		9		
		8		
P. C. C.	L.	$7 \div 23.7$	<u>1 Curve Left $6^\circ 26'$ L. C. = 643.3'</u>	
		7		
		6		
T. P.		$5 > \frac{5}{5 \div 01.9 = 4 \div 99.9}$	$13^\circ 22'$	$445.6'$
	(223.8)	5		
P.	L.	$3 > \frac{4}{2 \div 78.1}$		
		2		
		1		
		330		
T. P.		$9 \div 72.8 = \div 67.3$	$18^\circ 29'$	$616.1'$
	(310.8)	9		
		8 ()		
		7 (0.4)		
C. P.	L.	$6 \div 62$		
		6 (0.9)		
		5 (offset)		
		4 (17.7)		
T. P.		$3 \div 62.1 = \div 56.9$	$18^\circ 09'$	$605.0'$
	(3.03.1)	3 (15.2)		
		2 (5.5)		
		1 (0.5)		
P. C.	L.	$320 \div 57$	$50^\circ 00'$	1666.7
			<u>3 Curve Left 50° L.C. = 1666.7</u>	

Note.—The sum of the short tangents has no relation to the sum of the sub-tangents to the curve.

You will have noticed that the stakes were offset to the curve, if required; that has not been the custom; on the contrary, stakes are set in the lines as cut, but with the initial letter before the station numbers omitted, and with the words "offset Left — ft." written on the back of the stakes, except on those stakes set where the tangents touch; these are fully marked, thus, L. 326+62.

The reasons for this: Offsets at an exact right angle are often not practicable because of the trees. (For this reason also a close calculation of abscissa is not made, that for the nearest five-foot being deemed sufficient.) The rodman and leveller readily find the stakes in this position, and use them—which is perhaps doubtful in the case of stakes hidden in underbrush—the topographer also has definite points and elevations to work from. The rear chainman has an undisturbed point at which to hold the chain; these stakes are left standing and are verified by the topographer; the chainmen know that this will be done. Foremen of clearing gangs, when properly instructed, have no difficulty in laying out the right-of-way correctly.

The chief instrumental advantages of this method, in rough ground covered by trees or broken by water, cliffs, etc., are the avoidability of short sights and the latitude possible in the choice of ground for the transit points. Curvature being introduced, largely to avoid obstructions, and the curve running around the hills, the tangents are often in better ground, being outside the curve, whereas the long chords being inside often cut across very bad ground indeed.

It might be noted, too, that for equal lengths of abscissa to a curve, there is always one less transit point by this method than by that of a chord method.

Other advantages are: The picketman and axemen do not wait for the chainage, but cut ahead to any point at the discretion of the picketman. The chainmen have plenty of time to properly do their work, and do not delay others, as the chainage of the hub at the end of the line is not required until the transit is brought forward and set up, except in one case, i.e., the final hub.

One transit point alone, no matter how long the curve (except it be compounded, when two are set) demands exact placing, and that being an unusual operation, is more likely to be properly performed. A chainman who will insist on and will secure the exact setting of a point when it is a duty repeatedly performed is a jewel rare. Errors of considerable magnitude are liable to occur, especially when one of the party is an habitual talker, the fascination of a joke completely dulls the fine edge of observation; a hub may be driven plumb, or when driven be several inches out of place, and the point taken on it anyhow, so that the point of the joke be not missed.

The procedure, to emphasize the idea in all minds, that this

is an important duty and one that must be done properly, has been as follows: When a hub is to be set to chainage, the chainmen first lay off the correct plus; the picketman drives the hub, the chainmen lay off the plus again, marking a line at right angles to the transit line across the hub; the picketman takes point therein; if for any reason the hub does not contain both, the operation is repeated until it does. The essential feature of this is, that the chainmen, who are held responsible, shall repeat the measurement as often as necessary, and shall remain in position to repeat it until after the signal has been given for the transit to come ahead.

The transitman, when in position to look back along the line, sets his vernier at 180° , sights back, and revolves the upper limb but does not plunge the telescope; his vernier is now at 0° , and the angle is set off by direct reading. This was found necessary as the cross-hair diaphragms of the instruments supplied were much too thin, and in the extreme changes of temperature (often 40 degrees in a morning and as much in the afternoon) considerable hourly variations in the line of collimation were found.

The chainmen have been required to blaze a large tree on that side facing the hub, and to mark thereon all information, as at P. C.: "P. C. 3° C. Left 50° ," or as at transit point: "T. P. A Left $18^\circ.09'$. $323+62.1 = 323+56.9$."

The picketman's instructions included the following:

Hubs shall not be set, where avoidable, in soft ground or in ground that is worked by the roots of a wind-swayed tree, nor point taken on a stone nor on bare rock. (It is possible that tangential transit points, being, as they are, distant from centre line, may remain through construction days and furnish permanent reference marks.)

Hubs shall not be set, when approaching a steep rise, close up to the foot of it, but far enough back therefrom so that the transit may be able to see to the top of it, nor so far beyond the crown of the rise that more than two feet, at the foot of the picket, is hidden from the transit thereby.

A general order to all: No one shall stand in the line, neither between the picket and the transit, nor behind either, that their signals may not be obscured.

This method may be combined with the chord method by setting a hub at any C. P. and then proceeding in the usual way, and may be used at any time in avoiding obstructions, etc., etc.

In the event of an inaccessible P. C., the tangent is produced to

a convenient point, the proper angle turned there and a point on curve set; thence the remainder of the curve is run in.

Should an obstacle cover the P. C. and prevent the production of the tangent, a hub is set in the tangent, an angle turned, and the proper tangential distance set out therefrom; through the latter point a line is run parallel to the tangent, whose length is equal to that tangential length already laid out, plus the distance from hub on tangent to P. C. This is now a point on curve, and a line through it parallel to the sight line off the tangent is also tangent to the curve, so that the remainder of the curve may be laid out therefrom as desired. An obstacle within the curve may be avoided by following a tangent from any suitable point on the curve until that obstacle is passed, thence setting a point on the curve and continuing as usual.

The field book published by Edward Butts contains a table of tangents and arcs for each minute of deflection for curves of whole degrees from this by inspection or by simple multiplication one obtains the angle and arc corresponding to the stated tangent.

[This Association is not responsible, as a body, for the opinions expressed in its Papers by Authors.]

AN OLD-TIMER'S HOLIDAY TRIP.

BY MR. CHARLES UNWIN, O.L.S.

Captain Gamble, our esteemed Secretary, having requested me to write a paper for the present meeting, and not being willing to accept my statement that I was unable to comply with his wish, I will do my best to supplement my former reminiscences by giving an account of a holiday trip taken during the past summer.

Our good City of Toronto gives its permanent employees two weeks' holidays during the year, and not wishing my work to get too far behind, I divided my fortnight into two parts.

During the first part I took a trip to Georgian Bay, where I had an invitation to spend some time (in fact, no time limit was set) with some friends who live on "Present Island," which place I saw for the first time in 1851 when on my way with the late Col. Dennis—afterwards Surveyor-General, but then plain John Stoughton Dennis, P.L.S.—to survey several Indian reserves along the north shore of Lake Huron.

At that time the Indians were gathering on the island for their presents, from which custom the present name of the island is derived.

The house owned by my friends on this island was built by a wealthy lumberman, and apparently money was no object to him. He evidently did not make it by surveying, for during my long life I have known of few, if any, in our profession who had made more than they could comfortably get along with.

I am told that Mr. Dodge, the former owner, had many hundreds of scow-loads of good loam put on the island, which in its natural state was like most of the islands in the Georgian Bay, nearly all bare rock or moss-covered. There is now a good garden and a most spacious mansion, with the same conveniences as are enjoyed in the best houses in Toronto, viz., hot and cold water, baths, lavatories, and in fact, everything that the most fastidious could think of. The rooms are very large and lofty—my bedroom was about 18 x 20.

Present Island is just opposite the town of Midland, about half an hour's journey by gasoline launch and about an hour from Penetanguishene, now called Penetang.

EXTRACT FROM DIARY, 1907.

Tuesday, 9th July.—Took 11.45 a.m. train for Penetang; went on parlor car with Misses Bessie and Margaret McAuley as far as Allandale, where I had to change cars for Penetang, leaving my friends in the train for Deerpark. I was shown into a car said to be for Penetang, but soon found out that it was for Toronto, but had plenty of time to change and proceed on my way to Penetang, where I arrived about 3 p.m., meeting Miss Currie, my sister, and Messrs. Barclay, Graham, Watson, the Curries' nephew, and Garvin Langmuir.

After spending a little time in Penetang, we went in a launch to Present Island.

Wednesday, 10th, went to Penetang, where I called on an old gentleman (Mr. Thompson, now the oldest man in the town), whom I had met when visiting the place in 1851, and from whose elder brother Col. Dennis hired his men and bought his supplies for his Indian reserve surveys.

I have a very distinct recollection of our being at church together. The church was on the road between Penetang and the Reformatory. There was a good deal of brush about the church in those days, and the mosquitoes were very numerous.

Thursday, 11th, went to Midland in morning. In afternoon commenced making rough traverse of Present Island with pocket compass and a 50-foot tape, and stepped the off-sets.

Friday, 12th, continued traverse, but had not time to finish. Left for Toronto about 11 a.m., arriving at the Union Station about 4 p.m.

In 1848 I assisted on a survey of the Indian reserve on Balsam Lake, and this having been my first experience of "roughing it," I was seized with a desire to re-visit the place after an absence of 59 years.

My nephew, Mr. Chas. J. Agar, and I determined to take a trip, that I might see the place again, so left Toronto on Monday, Aug. 12th (in the second part of my annual holiday allowance) and stayed that afternoon and all Tuesday with a niece, Mrs. Cortez Fessenden, at Peterborough. She being, like myself, an early riser, we took a ramble before breakfast on Tuesday morning down to the park by the River Otonabee.

In the afternoon Mr. Fessenden and his son Vivian, my grand-nephew, with Mr. Agar and I, walked out to the lift-lock on the Trent Valley Canal and went down to see the machinery, going down under the one of the two basins which was up at the time.

On Wednesday morning Mr. Fessenden, Mr. Agar and I took G. T. R. train at Peterborough for Lakefield, at about 8.40.

Lakefield is near the southerly entrance of Stony Lake, about 10 miles from Peterborough. We left Lakefield by the steamer "Stony Lake" shortly after our arrival, and had a delightful trip on the Kawartha Lakes (or some of them.) The first lock is at Lovesick. Here we had a good dinner on the boat, and the table-girl, who announced three kinds of pie, was startled by one of the party asking her for a large piece of raspberry pie and a larger piece of cherry pie. We arrived at Burleigh Falls about 12.45 p.m., and portaged our things a distance of about 200 yards to the steamer "Ogemah." We left Burleigh Falls at about 1.15 p.m., arriving at Buckhorn at 1.25, and got through the lock at 1.38. Took in wood at 3.10, and left again at about 3.35. We had a good supper on the "Ogemah" and arrived at Bobcaygeon in due course. There were no available rooms for us at the hotel, but we were directed to "the cottage" which belongs to the owner of the hotel, and here we got three good separate rooms. On our arrival at Bobcaygeon we learned that the boat by which we were expecting to go to Cobocok next morning had had its trip cancelled on account of a regatta coming off at Chemong. We were therefore compelled to make arrangements for driving, and engaged a rig at James N. Hill's livery to take us to Cobocok next morning, Mr. Hill undertaking to drive us there himself. We four, therefore, left in a comfortable carriage, drawn by a pair of good horses, about 8 o'clock on Thursday morning. Mr. Hill proved to be a jovial soul, and his laugh over a funny tale or a joke was worth travelling to hear. As we were driving through the country he said he would show us orange lilies growing in a Roman Catholic burying-ground, and so he did.

His feet are unfortunately crippled, so that he has to walk on the sides, as it were, and to wear specially constructed boots. He told us with great glee a story of someone in the barber shop sending a newcomer, who wanted to skate, down to him to borrow his skates. He "caught on" and gravely told the applicant that he had loaned them to so and so, to whom he might go—and this supposed lender was worse crippled than he!

At Fenelon Falls, where we stayed only a few minutes to make enquiries as to the best way to get to our destination, Mr. Agar hired a kodak. We then proceeded to the village of Rosedale,

which is some three miles in a straight line across the lake from the southerly end of Indian Point. We arrived there about 10.30 or so and tried to hire a boat to take us to the Point. We were told that Mr. Goodman, a contractor, who had two launches and who was away with one of them with a Government engineer, would be back about noon, so we decided to wait. We had a very good dinner at Rosedale and went to see the pretty little English church. Mr. Goodman did not arrive until one o'clock, and although he had just received word from Toronto of the death of his mother, necessitating his leaving with his son for that city at about 3 o'clock, he kindly hired to us his small gasoline launch and sent his son to manage it. We got about half way to Indian Point when the launch suddenly refused to go any further (the motor wouldn't "mote"), and there we were. And the boy had to be back at Rosedale at 3 o'clock. We had a pair of oars, but there was a very rough sea on, and I must confess that I felt very uneasy, remembering that Mr. J. K. Roche, P.L.S., was drowned in this very lake.

I may give here an extract from an old note-book, recording the sad occurrence:

"Mr. J. K. Roche, one of the examiners when I was admitted into the profession in April, 1852, was drowned in Balsam Lake on the 13th September, 1859, while engaged on a Government survey, or, I think, returning from one. The newspaper account said that there was quite a gale on the lake, and his canoe-men tried to dissuade him from trying to cross, but he was most anxious to proceed, and determined to venture. The canoe upset, the men swam ashore, but poor Mr. Roche was drowned."

Young Goodman knew that Mr. T. D. Delamere, K.C., who has a summer residence at Balsam Lake, had a fine launch, so rowed in the direction of the Delamere home, and our plight being observed, the launch was sent out to us, and we were, after calling at the Delamere landing, conveyed to Rosedale. We then determined to try and reach Indian Point by land, so the horses were again hitched up and we set off for Cobocank, which burg we passed through without seeing tangible evidences of the university of which Jimuel Briggs long ago claimed to be a graduate. We drove down the roads towards the Point, but about a mile or two from the main road we were barred by a fence and confronted by a note for trespassers to beware. This fence apparently marked the north end of the Carnegie Ranch property, Mr. Carnegie now having Indian Point and lands behind it.

My nephews and I set out to walk at least a part of the way, and having gone some distance, seeing on our way some fine cattle

grazing, we found another gate not locked, which we opened and proceeded on our way a little further. It was growing late, and having the long drive to Bobcaygeon ahead of us, we returned to the carriage, having taken several snapshots, among others the locked gate and the warning, and set out for Coboconk. The only chance now of reaching Indian Point was to go by launch from Coboconk, if we could find such a thing there. We enquired and found that there was one at the sawmill, but lo! the young man who had it had not enough gasoline on hand to take my nephew and me down to the Point and then across to Rosedale (to which place Mr. Hill could have driven, picking us up there), and get back with his launch to Coboconk, so we had to abandon the attempt to reach the point and drive back to Bobcaygeon.

We had supper at Fenelon Falls on our return journey, and rested the horses for about 50 minutes, then pushed on and arrived at Bobcaygeon about midnight.

Next morning, Friday, 17th, we took the steamer "Ogemah" at about 7 o'clock, and arrived at Chemong about 9 o'clock. The stages for Peterborough were crowded, but I managed to get a seat on one in front with the driver and two others, leaving my nephews to walk the six miles from Chemong to Peterborough, but fortunately for them, the owner of an express waggon, who knew Mr. Fessenden, gave them passage, and much to their delight overtook and passed us on the way to Peterborough, and they were waiting for me at a street corner when my vehicle came along.

We had splendid weather until a short time before our arrival in Peterborough, when it began to rain a little.

I may say that on our way up the lakes there was much smoke from bush-fires.

Taking it altogether, we had a very pleasant outing, although I did not get quite to Indian Point, reaching within about a mile and a half of it by water and four miles by land. We might have tried it by air, but no airship hove in sight while we were in the vicinity.

My nephews were most kind in looking after my comfort.

SUCCESSFUL ATTEMPT TO REACH INDIAN POINT.

At the end of the following week Mr. Agar and I made another attempt to reach Indian Point, having communicated with the owner of the launch at Coboconk and found that he could take us down on Saturday morning. We left Toronto from Riverdale Station on Friday afternoon, Aug. 23rd, about 5.15, and arrived at Coboconk about 9 o'clock. We made arrangements with the launch-owner to meet us at 8 next morning.

Saturday morning was dull and threatening rain. We left Cobococonk about 8.30, and, after experiencing a couple of heavy showers, about 10 o'clock got to the point near where the deserted houses of the old Indian village stood at my first visit, 59 years ago. We discharged the boatman and boy with the launch, intending to return the five or six miles to Cobococonk on foot, but happily Mr. Weed, Mr. Carnegie's manager, after showing us round the buildings, drove us about half of the distance.

We met at the Point four young American gentlemen who were taking a holiday. They had camped on an island near Mr. Carnegie's place, and were invited to come to the main land. They joyfully accepted the invitation and spoke most gratefully of the kindness shown to them, as we may also do, for Mr. Weed was very courteous. Mr. Carnegie himself was away from home. The ranch contains some 1,500 or 1,600 acres and many ground hogs infest it. Over 300 had been killed during the season, as the little creatures do much damage. Mr. Agar and I reached Cobococonk about 12.30 p.m.

Our train was due to leave for Toronto at 3.30 p.m., but a telephone message was received at the hotel from the station that the train was delayed by a laden coal car having broken down on the track some 12 miles from Cobococonk. We were in great fear that we could not get to Toronto until Monday afternoon, and we were both due at our respective offices on Monday morning; my nephew at 9.30 and I at 9 o'clock. We had some idea of getting a man to drive us to Orillia, some 50 miles away, to catch a train passing there early on Sunday morning, but the livery man was unwilling to make the trip, even if we had needed him. We were rejoiced to hear, however, that the train was coming, and when it made its appearance about 6.30, we, together with an American lady and a little girl, lost no time in boarding the one car which the engine was to draw.

I might say that we put in a strenuous protest to the agent early in the afternoon against the City Surveyor of Toronto and the Accountant of the Succession Duty Office of Ontario being left stranded by the Grand Trunk over Sunday.

Well, the train started without delay and tore along over the Cobococonk branch at a rate to surprise the natives. We could not connect with the train for Toronto, which we should have done under normal conditions, but by going, via Lorneville, for Lindsay, we there caught the train from Toronto for Port Hope, via Peterborough, and we got to Port Hope Junction about 10.10 p.m.

If I was glad to get off Balsam Lake, Mr. Agar was glad to get off that train at Lindsay.

At Peterborough the train was boarded by some young fellows who had been playing baseball with a Peterborough team and who had been beaten. The liquid consolation which had been imbibed by some, and the natural flow of youthful spirits, made them, or some of them, very noisy, and unpleasantly (for lady passengers) boisterous.

They left us at Port Hope to go on to Cobourg. We had to wait in the railway station at Port Hope Junction until a few minutes after 4 on Sunday morning. We saw the comet and Orion in the early hours of Sunday. Toronto was reached about 6.10. Cabs were in demand, but we got one which took a young lady passenger to the Arlington, us to Seaton street, and the American lady, Mrs. Taylor, and her little girl, to First avenue.

"Keeping everlastingly at it brings success," and by keeping at it I managed to get to Indian Point, although at the first attempt all things seemed against it. And I may say in closing that it was very interesting to me to re-visit these two scenes of work of so many years ago.

I trust that many of my young brothers in the profession may live to enjoy a green old age, "frosty, but kindly," and in their turn have the pleasure of, after the lapse of many years, looking upon the very spots of mother earth's surface upon which they planted their early pickets or handled the faithful chain.

BIOGRAPHICAL SKETCH OF C. G. HANNING'S PROFESSIONAL CAREER.

A native of the County Cork, Ireland. Born in the year of grace 1826. Entered Trinity College, Dublin, October, 1843. Went through the Engineering course in the School of Engineering attached to the College. After the prescribed time passed my examinations and obtained my diploma from that school. In 1846 and 1847 engaged in Sir John MacNeil's office, Dublin, and also for several months on the survey and construction of the G. S. W. Ry., Dublin to Cork, in the neighborhood of both city of Cork and town of Mallon.

In the year following (1848) came to Montreal in August, and in November following was engaged as Assistant Engineer on the re-measurement of the St. Lawrence and Atlantic Railway (now the G. T. Ry.), between Montreal and St. Hyacinthe, the only part completed then; on this work several months. In the autumn of 1850 came to Brantford, and as rodman was on the survey of the G. W. Railway between Woodstock and a point some miles west of London. Early the next year was leveller on the final location of line between these points, and then first assistant on construction of same line from Woodstock to middle branch of River Thames, some 13 miles. On this work to end of December, 1853, when I resigned and went back to the Old Country. Returning to Canada after eight months and not being successful in obtaining employment as a civil engineer, I turned my attention to other pursuits; took up my residence in Montreal, and went into commercial business.

Before doing this, in the summer of '54, A. McBean, railway contractor, and myself, walked over the newly located line of railway from Brockville to Arnprior for the purpose of inspection of country, etc., before he tendered for the construction of part of it.

The business I was in at Montreal not coming up to my expectations, I left there November, 1856, and came to Bowmanville, and went as assistant to the late Messrs. Herrick and W. Napier,

who had an engineering and surveying office there. When with them I assisted W. Napier in a preliminary survey for a proposed railway from Colborne, on Lake Ontario, to the rear of the country, via Castleton.

Messrs. H. and N. leaving Bowmanville, I articulated myself to the late L. Shortt, P.L.S., for one year, and in July, 1858, obtained license to practice as P.L.S.

In May, 1860, I got instructions from the Crown Lands Department to survey the townships of Rore and Lefroy, on the north shore of Lake Huron, also to run a line for public road across St. Joseph Island. This and other work for the Huron Bay Copper Mining Co. did not permit my return until July, 1861. From that date to July, 1865, I surveyed for private individuals and municipalities, and for the townships of Darlington and Clarke. Under instructions from the C. L. Dept. re-surveyed several blocks of concessions, planting permanent monuments at the angles of each township lot and making plans in duplicate of each survey. In July, 1865, came to Pit Hole, in the oil regions of Pennsylvania, and in company with W. Murdock, P.L.S., had good success for eight or nine weeks, staking out locations and preparing plans of same for the oil speculators, but owing to ill-health had to come away.

January, 1866, came to the oil region at Bothwell, Ont., and in partnership with W. Murdock and P. A. Peterson, late chief engineer of the Canadian Pacific Railway, carried on the same work as at Pit Hole until the month of April, when a general collapse of all kinds of business took place owing to the Fenian Raid scare, the speculators from Chicago and elsewhere leaving in a hurry without settling up accounts, I regret to say.

'66 and '67 private and municipal surveys, prepared plans of the town of Bowmanville and the villages of Newcastle and Orono. December, 1867, came to Nova Scotia to take charge of construction of eight miles of railway from coal mines at Westville to tidal waters of Pictou Harbor. Returned to Bowmanville in December, 1868.

October, 1869, took charge of the final location of that part of the Toronto & Nipissing Narrow Gauge Railway line between Stouffville and Cannington, and also of the construction of the roadbed between same points until the completion of same in March, 1872, changing my residence to Uxbridge in the meantime.

In March, 1872, ran a preliminary line for branch railway from Stouffville to Sutton and Lake Simcoe (Jackson's Point), and made an approximate estimate of cost of same for the promoters.

In 1873 re-measured rock cutting and other work on newly-built line between Galt and Blair, on the Galt and Berlin Railway, to adjust dispute between the contractor and the Corporation of Galt.

In the autumn of same year, under instructions from Mr. Wragge, chief engineer of the Toronto, Grey & Bruce Railway, located railway line from a point east of the village of Wroxeter to Teeswater, and prepared right-of-way plans for same. Between years 1872 and 1876, besides the above railway work, made several surveys under instructions from the Crown Lands Department for the township municipalities of Uxbridge, Georgina, Eldon, Brock and Cartwright; re-surveys and permanent monuments, as before mentioned, and also located the extension of the Toronto & Nipissing, Cobocok to Norland, eight miles, but not built.

In May, 1876, located line and got up plans for construction of railway from Port Perry to Lindsay, and had charge of same until its completion, September, 1877. Previous to this, got up the right-of-way survey and ground plans on branch line Stouffville to Lake Simcoe. 1877 to October, 1880, engaged in municipal and other surveying work. At the latter date, under instructions from Jas. Ross, C.E., commenced location of a railway line from Napanee to the village of Tamworth, via Newburgh and Yarker villages. Engaged in this work and preparing plans and estimates of same early the following year.

In the spring of same year located the extension of the C. V. Railway from Ingersoll to St. Thomas, under instructions from Jas. Ross, then superintendent of the C. V. Railway. Also got up estimates for drainage for part of the township of Ops in the summer.

October, 1881, received instructions from Hugh Lumsden, chief engineer of the O. & Q. Railway (now C. P. Ry.) to locate the line from West Toronto Junction to a point where the Manvers Station is at present. Finished this in the spring of '82, and had charge of construction from Agincourt Station to Claremont, and of the ballasting, Agincourt to Myrtle Station, until September, 1884. Came to live in Toronto, November, 1883.

January, 1885, surveyed, made plan and subsequently subdivided Georgina Island, Lake Simcoe, for the Indian Department. Same year, October to December (three months) on re-measurement work for the C. P. Railway north of Lake Superior, and at intervals afterwards. 1886 entered into partnership with Chas. Murphy, P.L.S., and later on took in H. L. Esten, P.L.S.. July to November, 1887, under instructions from the late A. Macdougall, C.E., of the City Engineer's staff, engaged on survey

north of Toronto to ascertain if a sufficient supply of water for the city could be obtained from the lakes on the Oak Ridges and sources of the Don River; also had levels taken to Lake Simcoe, plans, profiles and estimates prepared and made out and duly submitted to the City Engineer.

In 1880 myself and H. L. Esten prepared plan of right-of-way of the proposed B., H. & T. Railway, from the Humber to Simcoe street, in Toronto; also plan of Stouffville. 1890, dissolved partnership with Murphy and Esten and came to reside in Preston the following year, practically retiring from all active work outside the limits of the immediate neighborhood, and only living here because my son, a lawyer, had his practice here.

C. G. HANNING.

Preston, July 17th, 1904.

BIOGRAPHICAL SKETCH OF MILTON C. SCHOFIELD'S PROFESSIONAL CAREER.

Guelph, 7th March, 1898.

I enter my 80th year to-day, being born on the 6th day of March, 1819, in the Township of Bastard, in the County of Leeds.

I was early placed in my father's general country store, in which he kept drugs and the post office. As I preferred a more active and outdoor life, I chose surveying, and licensed in September, 1843, after serving the then required apprenticeship of (6) six months with the late George Bruce. I soon discovered the apprenticeship was far too short, even if continuously employed, though I readily passed my examination under the late Andrew Russell, but principally theoretical.

In 1845 I was employed to re-survey the road from Owen Sound to within four miles of Guelph, a distance of over 80 miles, the Government having granted a large sum to be expended thereon. There were but 43 buildings then in Owen Sound, only four being frame.

I was employed most of 1846 in Fergus and neighborhood. In 1848 I opened a country store on the rocky Saugeen, in Bentinck, four miles north of present town of Durham.

In 1849 I was appointed postmaster. In 1850 I built a mill on the "Rocky." The following winter the late J. S. Dennis laid out part of Bentinck and Glenelg. Soon after the late David Gibson surveyed the Durham road from Mono Mills, also the town plot of Durham. The late Mr. Brough near about the same time surveyed the township of Brant. All three parties obtained their mail matter and some supplies at my store.

Mr. Brough was taken sick in camp while surveying township of Saugeen, and was carried through the woods a long distance to Kincardine. at which place or Goderich he died.

In 1853 I commenced sub-dividing six hundred (600) acres in Berlin for the late Sheriff Grange of Guelph, for whom, and others, I done much in Guelph, and continued laying out town sites between it and Stratford during building of the G. T. Railway, after which I re-surveyed many villages and prepared maps for registration in Waterloo and adjoining counties.

I had some fine long surveys in Stratford, Goderich, Chippewa and Queenston. I settled in Berlin in 1859, when just 40, quite young enough to marry. I moved to Guelph in 1880 and confined

my practice to the city. In 1887 I was forced to relinquish practice owing to loss of hearing, but sight remains good and I use no glasses—have none.

In May, 1897, becoming free of sciatica, of 21 years' torture—rheumatism, after effects of la grippe and other ailments, I ventured in July to survey "Beauty Island," one and a quarter miles from Little Current. I camped out a few nights, got wet three times, and returned in September in far better condition in every respect than when I left, first of July. I am endeavoring to get survey of another island this summer. Want of hearing is not such embarrassment on such work as where greater accuracy is required.

MILTON C. SCHOFIELD.

BY-LAWS OF THE Association of Ontario Land Surveyors

AS REVISED 1899

(To take the place of all previous By-laws passed by the Association.)

Definitions * Definitions in the following By-laws as defined by the "Ontario Land Surveyors' Act."

The word "Association"	means	The Association of Ontario Land Surveyors.
" " "Council"	"	The Council of Management.
" " "Board"	"	The Board of Examiners.
" " "Chairman"	"	The Chairman of Council.
" " "Secretary"	"	The Secretary-Treasurer.

PREAMBLE.

Authority for By-Laws. The following By-laws are enacted under the powers granted by the "Act respecting Land Surveyors," Cap. 180, R.S.O., 1897.

THE ASSOCIATION.

Annual Meeting of Association. 1. The Annual General Meeting of the Association shall be held (as provided by the said Act) in the City of Toronto, on the fourth Tuesday in February in each year, at such place as may be selected by the Council.

Special Meetings. 2. Special meetings of the Association may be called by the President, or shall be called by him at the written request of ten or more members.

Notice to be given by Secretary. 3. Due notice of such meetings shall be given by the Secretary to each member of the Association by circular letter posted to his registered address at least 10 days before any such meeting.

Constitution of quorum. 4. Fifteen members shall form a quorum at any meeting of the Association, for the transaction of business.

THE COUNCIL.

Duties of Council. 5. In addition to the duties assigned to the Council by the said Act, it shall have the direction and management of all the affairs of the Association, and shall appoint the several Standing Committees and name the Chairman of each.

6. There shall be two regular meetings of the Council in each year, one to be held during the Annual Meeting of the Association, and one on the third Tuesday in April. Regular Meetings of Council.

7. Special meetings may be called by the President or Chairman. Special Meetings of Council.

8. Due notice of every such meeting shall be given by the Secretary to each member of the Council. Notice to be given by Secretary.

9. At any meeting of the Council when business relating to the property or to the financial affairs of the Association is transacted, five members shall form a quorum; for the transaction of any other business three shall form a quorum. Constitution of quorum.

10. The Council shall make a report of the affairs of the Association at the Annual Meeting, which report shall include the report of the Secretary and also of the Board of Examiners. Annual Report of Council

11. The Board of Examiners shall make a report to the Council at the Annual Meeting of the Association in each year. Board of Examiners to report to Council.

STANDING COMMITTEES.

12. The Standing Committees shall be as follows: Each shall be composed of not less than 5 and not more than 9 members. Standing Committees.

Committee on Land Surveying.

“ “ Drainage.

“ “ Engineering.

“ “ Topographical Survey.

“ “ Entertainment.

“ “ Publication.

13. Each Standing Committee appointed by the Council shall endeavor to advance the interests of the Association in that branch allotted to it. Duty of Standing Committees.

Meetings of any Standing Committee shall be held at the call of the Chairman, three members to form a quorum. Provision for Meetings.

Each Standing Committee shall present to the Association, or to the Council, an Annual Report on the work done by said Committee. Standing Committees to report to Association.

ORDER OF BUSINESS AT MEETINGS OF ASSOCIATION.

14. The following shall be the order of business at the meetings of the Association: Order of Business.

- (1) Reading of minutes of previous meeting.
- (2) Reading of correspondence.
- (3) Reports and papers.
- (4) Unfinished business.
- (5) New business.
- (6) Nomination of officers (if at the General Annual Meeting.)
- (7) Adjournment.

RULES.

Procedure

15. All motions must be in writing, and shall contain the names of the mover and seconder, and must be read from the Chair before being discussed.

Reports of Committees.

16. Reports of Committees must be in writing and signed by the Chairman thereof.

Rules of speech.

17. No member shall speak on any subject more than once, except the introducer of the subject, who shall be entitled to reply; every member, however, shall have the right to explain himself, subject to the discretion of the Chairman.

Discussion Closed.

18. When a motion has been finally put to the meeting by the Chairman, all discussion thereon shall be closed.

Majority vote may re-open any motion.

19. Any motion may be re-opened by a majority vote of those present.

Appointment of Scrutineers.

20. The Chairman of the meeting shall appoint two scrutineers when a ballot is taken, as defined in Sec. 22 hereof.

Speakers to Address the Chair.

21. Every member while speaking shall address the Chairman.

Voting at General or Annual Meetings.

22. All voting at any General or Annual Meeting shall be by standing vote, unless a ballot be demanded by at least two members.

Parliamentary rules to govern.

23. Parliamentary rules to govern in all cases not provided for in preceding sections.

DUTIES OF OFFICERS.

Presiding officer at Association meetings.

24. The President, or in his absence the Vice-President, shall preside at all meetings of the Association; in the absence of both, the meeting shall appoint a Chairman.

25. The Chairman shall preside at all meetings of the Council; in his absence the meeting shall appoint a presiding officer.

Presiding
Officer at
Council
Meetings.

26. In addition to the duties assigned to him by the said Act, the Secretary-Treasurer shall keep an accurate record of the proceedings at all meetings of both the Association and the Council in separate books, conduct all correspondence, announce all meetings, report the result of elections to the Commissioner of Crown Lands, the officers of the Association and the candidates for election, receive all fees and subscriptions and other moneys. He shall, under the direction of the Council, deposit all moneys in such bank or other financial institution as it may select. He shall pay no bills unless sanctioned by the Council and signed by the Chairman. All payments of \$10 and upwards to be made by cheque, signed by the Secretary, and countersigned by the President, or in his absence by the Chairman of the Council. He shall submit an account of all moneys received and paid by him under the said Act and these By-laws to the Council at the Annual General Meeting of the Association, and shall perform such other duties as may from time to time be assigned by the Council or the Association.

Duties of
Secretary-
Treasurer.

27. The Secretary-Treasurer shall give a bond in the usual form to the amount of \$1,000, such bond to be in the custody of the President, and deposited in the bank where the funds of the Association are kept.

The Sec-
Treas. to
give bond.
Where they
shall be de-
posited.

EXAMINATIONS.

28. Candidates for admission to apprenticeship are to be examined as follows, in the subjects prescribed in Rev. Stat. Ont., c. 180, s. 22; and no candidate shall be admitted unless he obtains at least the minimum marks set opposite each subject, and at least a total of 550.

Examination
of candi-
dates for
apprentice-
ship.

Subject.	Max. Marks.	Min. Marks.
1. Penmanship	50	30
2. (a) Orthography (including dictation)	50	40
(b) English Grammar	50	25
3. Arithmetic (Fractions, Decimals, Square Root)	100	60
4. Logarithms and Algebra (including Equations 1st degree)	100	60
5. Euclid (Books 1, 2, 3 and 4)	100	60
6. Plane Trigonometry and Rules for Spherical ...	100	50
7. Mensuration of Superficies	50	30
8. Linear Drawing (use of ruling pen and con- struction of scales)	50	25
9. Canadian and General Geography	50	25
10. Canadian History	50	25

Examination
of candi-
dates for
admission to
practice.

29. Candidates for admission to practice are to be examined as follows in the subjects prescribed in Rev. Stat. Ont., c. 180, s. 25; and no candidate will be admitted unless he obtains at least the minimum marks set opposite each subject, and at least a total of 1,000.

Subject.	Max. Marks.	Min. Marks.
1. Geometry, including the first 6 books of Euclid, excepting the last thirteen propositions of the fifth book	100	50
2. Algebra (simple and Quadratic Equations, Progressions and Exponents)	100	50
3. Trigonometry (Plane and Spherical)	100	60
4. Mensuration of superficies and laying out and dividing land	150	75
5. Descriptions by metes and bounds	100	75
6. Use and Adjustment of Instruments for surveying and levelling	100	70
7. Laying out of curves	50	30
8. Practical Astronomy, including finding of Time, Latitude, Longitude, Azimuth, Variation of Compass, and drawing Meridian Lines	150	90
9. Survey Act	150	90
10. Mines Act, Registry Act, Municipal Act, (so far as they relate to surveys and drainage), Ditches and Water-courses Act	100	50
11. Levelling	50	35
12. Principles of Evidence and drawing up Affidavits	80	40
13. Taking of Field Notes and Preparing of Plans	100	60
14. Geology and Mineralogy, (rudiments of)	75	40
15. Elementary Botany and the Forest Flora of Canada	50	25

30. If a candidate for admission to practice obtains at least the total of 1,000 marks, but fails to obtain the minimum marks in, at least, two of the subjects, such candidate may at a subsequent examination be examined only in the two subjects in which he has failed.

The Board
to regulate
examina-
tions.

31. The Board may make, from time to time, such regulations as it considers necessary for the proper carrying out of these examinations.

Complaints
against
members
or any un-
licensed
prac-
titioner to
be filed with
Secretary.

32. Any complaint against a member of the Association or against any unlicensed practitioner, shall be filed with the Secretary, who shall immediately forward the same to the Chairman.

The Chair-
man may
call a spe-
cial meet-
ing.

If the matter complained of is of a serious and pressing nature, the Chairman may, at his discretion, call a special meeting of the Council for the purpose of hearing said complaint; if not so acted on, the complaint

shall be heard at the next regular meeting of the Council.

In the case of a member of the Association, the Council shall take action as defined in the said Act. Procedure where the delinquent is a member.

In the case of any unlicensed practitioner, the Council, if satisfied as to the justice of the charge, shall name a prosecutor and direct him as to his action in the conduct of the case, and shall allot such portion of the penalties, or authorize the payment of such fees as it may deem expedient. Procedure where the delinquent is an unlicensed practitioner.

33. The Council shall have power to pass any By-law which it deems expedient for the good of the Association, and such By-law shall have the same force until the next Annual Meeting, as if it had been passed by the Association. Such By-law must be reported to the Association at the next Annual Meeting, and the action taken thereon. All members of the Association shall be notified by the Secretary of the passing of such By-law by the Council. The Council has power to pass By-laws.

34. Grants exemption from dues, under 55 V., c. 34, s. 10 (4), to Henry Strange, Milton C. Schofield; William Robinson, Joseph Kirk, Charles Fraser, Joseph M. O. Cromwell, H. O. Wood, F. H. Lynch-Staunton, and E. C. Caddy.

35. The annual fees to this Association paid by candidates admitted to practice at the session of the Board in February in any year shall cover the annual dues for the remainder of the then current Association year, and for the Association year immediately following the same.

36. Grants exemption from dues under 55 V., c. 34, s. 10 (4) to Thomas Coltrin Keefer, Nathaniel Edward Low, Thomas Cheesman, James McCallum, and Thomas W. Walsh.

37. Grants exemption from dues under 55 V., c. 34, s. 10 (4), to Royal Wilkinson Hermon.

38. Reduced the number of minimum marks in the subject of "Levelling." (Obsolete.)

39. "Whereas any registered surveyor desiring to give up practice can have his name removed from the registered list of practitioners at any time, upon giving written notice of such desire, and whereas it is desirable

that such surveyors may contribute papers and secure the reports of the transactions of this Association and exchanges, therefore this Council hereby enacts that such surveyors shall have the aforesaid privileges upon the payment of an annual fee of two dollars, and their names shall be printed in the list of members in the annual report of Association and properly marked."

40. Grants exemption from dues, under 55 V., c. 34, s. 10 (4), to Tom S. Rubidge and James A. Gibson.

41. Grants exemption from dues, under 55 V., c. 34, s. 10 (4), to Charles J. Wheelock, Thomas Weatherald, Michael Deane, John Smith Brown, and William Edward Yarnold.

42. Grants exemption from dues, under 55 V., c. 34, s. 10 (4), to Alexander Davidson.

43. Grants exemption from dues, under 55 V., c. 34, s. 10 (4), to Charles Unwin, Wm. R. Rombough and Henry Winter.

44. Changes the name of "Committee on Topographical Surveying" to "Committee on Topographical Survey."

45. Whereas any registered surveyor desiring to give up practice can have his name removed from the list of practitioners upon giving written notice of such desire, and whereas it is desirable that such surveyors may contribute papers and secure the reports of the transactions of this Association, therefore it is hereby enacted that such surveyors shall have the aforesaid privileges upon the payment of an annual fee of one dollar, and their names shall be printed in the list of members in the Annual Report of the Association and properly marked.

46. Grants exemption from dues, under 55 V., c. 34, s. 10 (4), to George Alexander Stewart.

RULES AND REGULATIONS
OF THE
Board of Examiners
for Ontario Land Surveyors.

Adopted by the Board of Examiners.

1. The examination sittings shall commence each day at 9.30 a.m., continue until 12.30 p.m., recommence at 1.30 p.m., and continue until 4.30 p.m., day by day until completed, subject to the direction of the Board.

2. All the papers will be collected at the close of each sitting, and candidates will not be permitted to write on any question on such papers at any future sitting.

3. Any candidate obtaining assistance during the hours of examination, by copying the papers of another candidate or otherwise, will at once be dismissed, and any candidate who shall permit such copying or give such assistance will be considered equally guilty and treated similarly.

4. The candidate shall sign each sheet and mark on the top the number thereof and of the subject or group of subjects. He shall mark in the margin the number opposite each question, and shall attach the several sheets, together with the examination paper, to the cover provided for that purpose.

5. The candidate shall not write on one line more than one step in geometrical or algebraic work. A single step may cover several lines, but two or more should in no instance be put on the same line. They should be written thus:

Because $A = B$

And $B = C$

Therefore $A = C$

6. No other person than the examiners, the secretary and the candidates shall be admitted into the examination room unless by permission of the Board.

7. No books or diagrams of any kind, except those allowed by the Board, shall be brought into the examination room.

8. Candidates are to present themselves punctually at the hours appointed for the commencement of the examinations, and no candidates will be allowed to enter the examination room later than fifteen minutes after that time, nor will any candidate be permitted to leave the room during a sitting, but so soon as he has finished his papers he may hand them to the secretary, after which he will not be allowed to re-enter until the next sitting.

9: A candidate rejected by the Board shall not be entitled to a new examination before the next regular meeting of the Board.

10. Each candidate for "Admission to Practice" shall bring with him an instrument suitable for taking the necessary observations required in Sec. (8), By-law 29, which he shall submit to the Board for their examination and approval, and he shall also submit a plan and field notes of a survey, both made by himself, which may be filed with his papers.

11. Each candidate for Admission to Apprenticeship shall bring with him a ruling pen and scale.

FEEES.

12. The following fees shall be paid to the Secretary-Treasurer for the use of the Association:

(1) By every person duly authorized to practise as a land surveyor under the provisions of this Act, on applying for registration under this Act, the sum of \$1.

(2) By each member of this Association, an annual membership fee of \$4.

(3) By each apprentice at the transmitting to the Secretary the indenture or articles of such apprenticeship, \$10; 62 Vic. 2, c. 11, s. 18.

(4) By each candidate for the preliminary examination on presenting himself for examination, \$10.

(5) By each candidate for examination, with his notice thereof, for receiving and entering such notice, \$1.

(6) By each applicant obtaining a certificate, as fee thereon, \$2.

(7) By each applicant receiving a certificate to practise, as an admission fee, \$30.

(8) By each apprentice with each transfer of articles as a fee for registering the same, \$2.

(9) By each applicant receiving a certificate to practise, being the fee for official notice in the *Ontario Gazette*, \$1. 55 V., c. 34, s. 7; 69 V., c. 27, s. 26.

LIST OF MEMBERS

1908

The names of those members granted exemption by By-laws ratified by the Association are marked *.

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Abrey, George Spencer, Toronto Junction.	6th April, 1906
Allan, John Richard, Renfrew.....	6th Nov., 1894
Grad. S.P.S.	
Ardagh, Arthur Gowan, Barrie.....	18th Feb., 1908
Aylsworth, Charles Fraser, Jr., Madoc.....	8th Jan., 1886
D.L.S.	
Aylesworth, John Sidney, Sharp's Corners, Ont.	9th Jan., 1871
D.L.S.	
Aylsworth, William Robert, Belleville,	
P.O. Box 2	8th Nov., 1861
D.L.S.	
Baird, Alexander, Leamington	7th July, 1877
C.E.	
Barrow, Ernest George, Hamilton.....	4th Oct., 1877
D.L.S., Mem. Can. Soc. C.E., City Engineer.	
Bazett, Edward, Huntsville.....	8th July, 1881
D.L.S.	
Beatty, David, Parry Sound.....	12th July, 1869
D.L.S.	
Beatty, Herbert John, Eganville.....	8th Nov., 1893
Grad. S.P.S.	
Beatty, Walter, Delta.....	19th July, 1858
D.L.S. M.P.P.	
Bell, Andrew, Almonte.....	14th Oct., 1901
B.A., Mem. Am. Soc. C.E., Mem. Can. Soc. C.E., Mem.	
Ont. A.A., D.L.S.C.E.	
Bell, James Anthony, St. Thomas.....	11th Oct., 1875
D.L.S., Co. Engineer, Elgin; City Engineer, St. Thomas.	
Bigger, Charles Albert, Ottawa, 145	
Gloucester St.	6th Jan., 1882
D.L.S., A.M. Can. Soc. C.E., B.C.S., Astronomer, Dept. Interior.	
Bingham, Edwin Ralph, Port Arthur.....	17th Feb., 1906
D.L.S.	

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Blake, Frank Lever, Toronto, Meteorological Office	13th April, 1875 D.L.S.
Blair, William John, New Liskeard.....	13th Feb., 1904 Grad. S.P.S.
Bolton, Ellsworth Doan, Listowel.....	7th Nov., 1899 B.A.Sc. (McGill).
Bolton, Lewis, Listowel.....	9th July, 1864 D.L.S.
Booth, Charles Edward Stewart, Toronto, 39 Bloor st. e.	6th April, 1882 D.L.S.
Boswell, Elias John, C.P.R. Construction Dept. Offices, Winnipeg, 135 Carlton st.....	7th Nov., 1896 Grad. S.P.S., D.L.S.
Bowman, Clemens Dersteine, West Montrose.	10th July, 1879
Bowman, Herbert Joseph, Berlin.....	7th Jan., 1887 D.L.S., Grad. S.P.S., Treasurer County Waterloo, Assoc. Mem. Can. Soc. C. E.
Bowman, Edgar Peterson, West Montrose..	17th April, 1907
Bray, Edgar, Oakville.....	6th Oct., 1866 D.L.S.
Bray, Lennox Thompson, Amherstburg....	17th Feb., 1902 D.L.S.
Bray, Harry Freeman, Oakville.....	10th July, 1882 D.L.S.
Bray, Samuel, Ottawa, Dept. of Indian Affairs.....	6th Jan., 1877 D.L.S., C.E.
Brian, Michael Edward, Windsor.....	17th Feb., 1906 B.A. Sc.
Brown, David Benjamin, Cornwall.....	23rd Feb., 1904 D.L.S.
Brown, George Laing, Morrisburg.....	19th Feb., 1898 Grad. S.P.S.
*Brown, John Smith (address not known)....	8th July, 1852 D.L.S.
Browne, Harry John, Toronto, 203 Albany Ave.	6th July, 1872 C.E.
Browne, William Albert, Toronto, 18 Toronto st.	10th April, 1876
Burd, James Henry, Parry Sound.....	2nd Oct., 1905 Grad. S.P.S.
Burgess, Edward LeRoy, Ottawa, 21 First Ave..	6th May, 1905

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Burt, Frederick Percy, New York, N.Y.	8th July, 1885
President "The American Architect," Times Bldg., New York.	
Burwash, Nathaniel Alfred, Toronto,	
113 Bloor St.	6th May, 1905
D.L.S., Grad. S.P.S.	
Bush, Clayton Elgin, Toronto	15th May, 1908
Grad. S.P.S.	
Butler, Matthew Joseph, Deputy Minister	
of Railways and Canals, Ottawa.	11th Jan., 1878
C.E., M.I.C.E., Mem. Am. Soc. C.E., Mem. Can. Soc. C.E.	
Byrne, Thomas, Sault Ste. Marie.	15th July, 1862
D.L.S.	
Caddy, John St. Vincent, Ottawa, 559 King st. .	6th Oct., 1866
D.L.S.	
Cameron, Alfred John, Peterborough.	9th April, 1889
Campbell, Archibald William, Toronto,	
Parliament Buildings	10th April, 1885
C.E., Deputy Minister of Public Works.	
Carre, Henry, 276 Albert st., Belleville,	
Box 203	8th Nov., 1861
M.O. & Georgian Bay Canal, B.A. and C.E. (Trin. Coll., Dublin), D.L.S.	
*Carroll, Cyrus, Prince Albert, Sask.	10th Jan., 1860
Mem. Can. Soc. C.E., D.L.S. District Surveyor and Engineer.	
Casgrain, Joseph Philippe Baby, Montreal. .	5th Jan., 1887
D. L. S., P. L. S., (Que.) C. E., Assoc. Mem. Can. Soc. C. E., Chief Eng.	
M. & P. J. Ry., Senator.	
Cavana, Allan George, Orillia.	8th July, 1876
D.L.S.	
Chalmers, John, Engineer's Office,	
C.N.R., Winnipeg.	14th April, 1896
Grad. S.P.S.	
Chipman, Willis, Toronto, 103 Bay st.	4th Oct., 1881
D.L.S., B.A.Sc. (McGill), Mem. Am. Soc. C.E., Mem. Can. Soc. C.E.	
Christie, Uriah Wesley, Chesley.	1st March, 1906
Clarke, Fred. Fieldhouse, Winchester, Ont. .	31st March, 1905
Grad. S.P.S.	
Clarke, Leonard Oswald, North Bay	14th Feb., 1903
Code, Abraham Silas, Alvinston.	14th April, 1896
Code, Samuel Barber, Smith's Falls.	1st May, 1905
Code, Thomas George, Alvinston.	17th April, 1907
Code, Richard Stanley, Alvinston.	17th April, 1907
Cotton, Arthur Frederick, North Bay.	11th July, 1874
Cozens, Joseph, Sault Ste. Marie.	7th July, 1875
D.L.S.	
Crerar, Samuel Rutherford, Toronto,	
School of Science.	1st March, 1906
D.L.S., B.A.Sc., Toronto.	

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Dalton, John Joseph, Weston, Ont.....	11th Jan., 1878 D.T.S.
*Davidson, Alexander, Arkona.....	11th Oct., 1858 D.L.S.
Davis, Allan Ross, 230 Portage Ave., Winnipeg, Man.	8th Jan., 1886 B.A. Sc. (McGill).
Davis, William Mahlon, Berlin.....	11th April, 1885 Grad. R.M. Coll. (Kingston), Town Engineer.
Deacon, Thomas Russ, Winnipeg.....	12th Nov., 1892 Grad. S.P.S.
Deans, William James, Brandon, Man....	11th July, 1884 D.L.S.
DeMorest, Richard Watson, Sudbury.....	9th April, 1889 M.E.
Dickson, James, Fenelon Falls.....	6th April, 1867 D.L.S.
Dixon, Howard, Can. Nor. Ry., Winnipeg....	14th Feb., 1903 Grad. S.P.S.
Dobie, James Samuel, Thessalon	21st Feb., 1898 B.A.Sc. (Toronto Univ.), D.L.S.
*Doupe, Joseph, Winnipeg, Man., 169 Edmonton st.	13th Jan., 1863 C.E. (McGill), D.L.S., P.L.S. (Man.), P.L.S. (B.C.).
Dunn, Thomas Hamilton, Winchester.	14th May, 1906 Grad. S.P.S.
Empey, John Morgan, Ottawa.....	16th Feb., 1907 D.L.S.
Esten, Henry Lionel, Toronto, 157 Bay st....	7th Jan., 1887
Evans, John Dunlop, Trenton.....	8th July, 1864 D.L.S. Mem. Can. Soc. C.E., Chief Eng. Cent. Ont. Ry.
Fair, John, Brantford.....	13th April, 1875
Fairbairn, Richard Purdom, Toronto, 452 Markham st.	7th Oct., 1876 Surveyor for Dept. of Pub. Works, Ontario.
Fairchild, Charles Court, Brantford.....	9th April, 1894 Grad. S.P.S., D.L.S.
Fairechild, William Howard, Brantford.....	17th Feb., 1900
Farncomb, Alfred Ernest, Red Deer, Alberta.	9th April, 1895 D.L.S.
Farncomb, Frederick William, London, 213 Dundas st.	6th Nov., 1889
Fawcett, Thomas, Niagara Falls.....	6th Jan., 1881 Dom. Topographical Surveyor.

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Fitton, Charles Edward, Orillia, Box 142.	10th April, 1879 D.L.S.
Fitzgerald, James William, Peterborough.	13th Feb., 1904
Flater, Frederick William, Chatham.	9th April, 1888
Ford, William Butters, Wabana, Nfld.	21st. Feb., 1898
Francis, John James, Sarnia P.O., Box 304	16th Oct., 1861 D.L.S.
Fuce, Edward Oliver, Galt.	17th Feb., 1906
Fullerton, Charles Herbert, New Liskeard.	7th May, 1906 D.L.S., Grad. S.P.S.
Galbraith, William, Bracebridge.	4th April, 1883 D.L.S.
Gamble, Killaly, Toronto, 31 Sussex Court.	6th April, 1888 D.L.S., P.L.S. (Man.), Sec. Assoc. O.L.S., Captain R.A. (Ret').
Gardiner, Edward, St. Catharines.	6th Jan., 1866 D.L.S.
Gaviller, Maurice, Collingwood, Box 164.	6th Jan., 1866 C.E. (McGill), D.L.S.
*Gibson, James Alexander, Oshawa.	7th April, 1855 D.L.S.
Gibson, Peter Silas, Willowdale.	19th July, 1858 C.E.M.S. (Mich. Univ.), D.L.S., Mem. Can. Soc. C.E.
Gibson, Wilbert Silas, Willowdale.	21st Feb., 1898
Gillon, Douglas John, Fort Frances.	9th Nov., 1895 Grad. R.I.E. Coll.
Graydon, Aquila Ormsby, City Engineer London.	8th July, 1880
Green, Thomas Daniel, Prescott, Ont.	7th Jan., 1885 D.L.S.
Griffin, Albert Dyke, B.A., Galt.	11th Nov., 1890
Halford, Abraham Joseph Bartholomew, Essex Centre..	
Hanes, George Samuel, Windsor.	6th May, 1905 Grad. S.P.S.
Hart, Milner, Toronto, 103 Bay st.	11th July, 1863 D.L.S.
Heaman, John Andrew, Kenora, Ont.	16th Nov., 1896
Henry, Frederick, London, Albion Bldg.	7th April, 1887
Hobson, Joseph, Hamilton, 346 Bay St. (south).	3rd Oct., 1855 D.L.S., Chief Eng. Grand Trunk Railway System.
Holcroft, Herbert Spencer, Toronto, 182 Bloor st. w.	17th Feb., 1902 D.L.S., B.A.Sc. (Toronto Univ.).

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Holland, William Hugh, Toronto, 1 Dunn Ave.	1st May, 1907.
Hopkins, Marshall Willard, Edmonton, Alta. D.L.S., B.A. Sc. (McGill), Assoc. Mem. Can. Soc. C.E.	13th Nov., 1893
Hutcheon, James, Guelph, 48 Glasgow St. Grad. S.P.S.	10th Nov., 1891
Irwin, James Moore, Rat Portage. D.L.S.	13th Jan., 1863
Jackson, John Herbert, Niagara Falls.	16th Feb., 1901
James, Darrell Denman, Toronto, 227 George st. D.L.S. B.A., B.A.Sc. (Toronto Univ.).	3rd Nov., 1891
James, Silas, Toronto, 227 George st. D.L.S.	19th July, 1858
Johnston, Herbert, Berlin. Grad. S.P.S.	21st Feb., 1905
Jones, Charles Albert, Petrolea. D.L.S.	8th April, 1881
Jones, John Henry, Sarnia, Box 194. D.L.S.	10th Oct., 1886
Jones, Thomas Henry, Brantford. B.A.Sc. (McGill), D.L.S., City Engineer.	10th Oct., 1878
*Keefer, Thomas Coltrin, Ottawa. D.L.S., C.E.	14th Aug., 1840
Kirkpatrick, George Brownly, Toronto, Dept. of Crown Lands D.L.S., Director of Surveys.	13th April, 1863
Laird, James Stewart, Essex. D.L.S.	6th April, 1867
Laird, Robert, Haileybury. Grad. S.P.S.	11th Nov., 1887
Lang, John Leiper, Toronto, 20 Leopold St.	2nd May, 1908
Lawe, Henry, Ottawa.	6th Oct., 1860
Lewis, John Bower, Ottawa, Brunswick House D.L.S., P.L.S. (Quebec), C.E.	4th Oct., 1883
Lougheed, Aaron, Port Arthur. D.L.S.	12th Nov., 1888
Low, Edward Hamilton, Sudbury. Grad. R.M.C. (Kingston).	17th Feb., 1902
*Low, Nathaniel Edward, Sarnia. D.L.S.	11th July, 1856

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD
Lumsden, Hugh David, Ottawa.....	4th Jan., 1866
C.E., D.L.S., M.I.C.E., Mem. Can. Soc. C.E., Chief Eng. Trans. Cont. Ry.	
MacKay, James John, Hamilton.....	25th Feb., 1899
MacKenzie, William, Sarnia.....	11th April, 1896
Grad. R.M.C. (Kingston).	
MacKenzie, William Lyon (not known)....	7th April, 1887
C.E.	
McAuslan, Herbert James, North Bay.....	19th Feb., 1906
D.L.S., B.A.Sc. (Toronto).	
McCaw, Robert Daniel, Welland.....	16th Feb., 1907
McCubbin, George Albert, St. Thomas,	
City Engineer's Office	9th Nov., 1895
Assistant City Engineer.	
McDowall, Robert, Owen Sound.....	11th Nov., 1890
Grad. S.P.S., Town Engineer.	
McEvoy, Henry Robinson, St. Mary's.....	10th July, 1875
D.L.S.	
McFadden, Moses, Neepawa, Man.	13th April, 1858
D.L.S., P.L.S. (Man.).	
McFarlen, George Walter, Toronto, City Hall,	
City Engineer's Office.....	11th Nov. 1858
Grad. S.P.S.	
McGrandle, Hugh, Huntsville.....	5th Jan., 1883
D.L.S.	
McKay, Owen, Walkerville, Ont., Box 324.....	7th Jan., 1887
M.C.S.C.E., Grad. S.P.S.	
McKenna, John Joseph, Dublin.....	9th July, 1860
D.L.S.	
McLean, James Keachie, Ottawa, Dept.	
Indian Affairs.....	8th April, 1876
D.L.S.	
McLean, William Arthur, Toronto,	
Parliament Buildings.....	21st Feb., 1898
A. M. Can. Soc. C. E., Engineer of Highways.	
McLennan, Murdoch John, Williamstown...	13th Nov., 1893
B.A.Sc. (McGill), D.L.S.	
McMullen, William Ernest, St. John, N.B.....	11th Nov., 1892
Asst. Eng. C. P. Ry.	
McNab, John Duncan (not known).....	9th Oct., 1879
McNaughton, Alexander Lorne, Cornwall.....	May, 1905
McNaughton, Finlay Donald, Cornwall.....	25th Feb., 1899

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
McPherson, Archibald John, Brockville....	10th April, 1897
B.A.Sc. (Toronto Univ.), D.L.S.	
McPherson, Charles Wilfrid, Dawson, N.W.T.	
Director of Surveys, Yukon.....	21st Feb., 1899
D.L.S., Director of Surveys, Yukon.	
McPhillips, George, Winnipeg, Man.....	9th July, 1885
D.L.S., P.L.S. (Man.).	
Manigault, William Mazyck, Strathroy,	
P.O. Box 300	8th July, 1876
Miller, Frederick Fraser, Napanee.....	8th Jan., 1885
D.L.S.	
Montgomery, Royal Harp, Prince Albert, Sask.	6th May, 1905
D.L.S.	
Moore, John MacKenzie, London,	
Albion Building	9th Oct., 1879
Moore, John Harrison, Smith's Falls.....	11th Nov., 1889
Grad. S.P.S.	
Moore, William James, Pembroke	18th Feb., 1908
Morris, Alfred Edmund, Montreal, Que. ..	10th April, 1879
Morris, James Lewis, Pembroke.....	7th July, 1886
D.L.S., C.E. (Toronto Univ.).	
Mountain, George Alphonse, Ottawa.....	9th Jan., 1884
Mem. Can. Soc. C.E., D.L.S., P.L.S. (Que.), Engineer for Railway Commission.	
Murdoch, William, Bowmanville	10th Jan., 1860
D.L.S., C.E.	
Murphy, Charles Joseph, Toronto,	
157 Bay st.	6th Oct., 1886
Nash, Thomas Webb, Kingston.....	7th April, 1854
D.L.S.	
Newman, John James, Windsor.....	21st Feb., 1898
Newman, William, Windsor,	
57 Sandwich st. w.	12th Nov., 1892
Grad. S.P.S.	
Niven, Alexander, Haliburton.....	8th July, 1859
D.L.S.	
Ogilvie, William, 27 Nepean st., Ottawa....	12th July, 1869
D.L.S.	
O'Hara, Walter Francis, 236 Waverly St.,	
Ottawa.	14th April, 1892
D.L.S.	

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Ord, Lewis Redmond, Hamilton, c.o. Traders Bank	8th January, 1885
Parsons, Johnston Lindsey Rowlett, Regina, Sask., Box 1004.....	6th May, 1905 D.L.S., Grad. S.P.S.
Patten, Thaddeus James, Little Current.....	5th Jan., 1883 D.L.S.
Paulin, Frederick William, Toronto	11th May, 1908 Grad. S.P.S., Toronto.
Pinhey, Charles Herbert, Ottawa, 110 Wellington st.	12th Nov., 1888 D.L.S., Grad. S.P.S., Assoc. Mem. Can. Soc. C.E.
Proudfoot, Hume Blake, Toronto, 130 Roxbor- ough st. w.	6th Jan., 1882 B.A.Sc. (Toronto Univ.).
Rainboth, Edward Joseph, Ottawa.....	11th Nov., 1887 D.L.S.
Rainboth, George Charles, Aylmer, P.Q....	11th July, 1868 D.L.S., P.L.S. (Que.).
Reinhardt, Carl, Box 303, Cobalt.....	25th Feb., 1899 B.A.Sc., McGill.
Roberts, Vaughan Maurice, St. Catharines..	5th April, 1887 D.L.S.
Robertson, James, Glencoe	11th July, 1885 Grad. S.P.S.
Roger, John, Mitchell	10th Nov., 1888 Grad. S.P.S.
Rogers, Richard Birdsall, Peterborough.....	9th Jan., 1879 B.A.Sc. (McGill), D.L.S.
*Rombough, William R., Toronto, 254 Borden st	14th Nov., 1848 D.L.S.
Rorke, Louis Valentine, Toronto, 199 Madison Ave.....	14th April, 1890 Grad. S.P.S., D.L.S.
Ross, George, Welland	10th July, 1879 A.M. Can. Soc. C.E., B.A.Sc. (McGill), D.L.S.
Routly, Herbert Thomas, Haileybury.....	1st May, 1907 Grad. S.P.S.
Russell, Alexander Lord, Port Arthur.....	16th April, 1873 D.L.S., P.L.S. (Que.).
Rutherford, T. N.	18th May, 1906
*Scane, Thomas, Ridgetown	7th Jan., 1865 D.L.S.

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
*Schofield, Milton C., Guelph, Ont.	28th Sept., 1843
D.L.S.	
Schwitzer, John Edward, C.P.R. Ry. Co., Winnipeg, Man.	16th Nov., 1896
B.A.Sc. (McGill).	
Seager, Edmund, Rat Portage	8th July, 1861
D.L.S.	
Selby, Henry Walter, 125 Howland ave., Toronto	8th Jan., 1876
D.L.S.	
Sewell, Henry DeQuincy, Toronto, 34 Yonge st.	9th July, 1885
D.L.S., A.M.I.C.E.	
Seymour, Horace Llewellyn, Edmonton, Alta.	2nd May, 1908
D.L.S.	
Shaw, John Henry, North Bay	17th Feb., 1900
Grad. S.P.S.	
Silvester, George Ernest, Sudbury	12th Nov., 1892
Grad. S.P.S.	
Sing, Josiah Gershom, Toronto, Room 71, Confederation Life Building	9th Jan., 1879
D.L.S., C.E., Public Works Dept.	
Smith, Angus, Regina	14th April, 1896
Grad. S.P.S., City Engineer.	
Smith, George, Box 25, Lindsay	7th April, 1861
Engineer for Co. Victoria and four Townships.	
Smith, James Herbert, New Liskeard	27th Dec., 1904
Smith, Charles Campbell, Ottawa	16th Feb., 1907
D.L.S.	
Smith, Walter, Lindsay	16th Feb., 1907
Speight, Thomas Bailey, Toronto, 703 Temple Building	6th Jan., 1882
D.L.S.	
Stacey, Albert George, Victoria, B.C.	30th March, 1908
D.L.S.	
Steele, David Layton, Meaford	May, 1905
*Stewart, George Alexander	8th July, 1852
D.L.S.	
Stewart, John, (address not known)	11th Nov., 1887
D.L.S.	
Stewart, Walter Edgar, Aylmer	12th April, 1892
Stull, William Walter, Sudbury	17th Feb., 1900
B.A.Sc. (Toronto Univ.).	

LIST OF MEMBERS.

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• NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Summers, Gordon Foster, Winchester.....	11th May, 1908
Grad. S.P.S., Toronto.	
Sutcliffe, Homer Wilson, Forest, Ont.....	11th May, 1908
Grad. S.P.S., Toronto.	
Taylor, William Verner, Montreal, Sovereign Life Building.....	7th Nov., 1896
Grad. S.P.S.	
Tench, William Eastwood, Niagara Falls.....	11th Jan., 1878
Townsend, David Thomas, Woodstock.	17th Feb., 1906
D.L.S., B.A.Sc., Toronto.	
Traynor, Isaac, Dundalk	16th April, 1873
D.L.S.	
Turnbull, Thomas, Winnipeg, Man., C. N. R. Eng. Office.....	6th July, 1878
D.L.S., C.E. (Toronto Univ.).	
Tyrrell, James Williams, Hamilton, Prov. & Loan Chambers, 7 Hughson St. S.....	8th April, 1885
C.E. (Toronto Univ.), D.L.S., Co. Eng. for Wentworth.	
*Unwin, Charles, Toronto, 126 Seaton st....	12th April, 1852
D.L.S., City Surveyor.	
Ure, Frederick John, Woodstock	7th April, 1887
D.L.S.	
VAN NOSTRAND, ARTHUR J., Toronto, 703 Temple Building.....	30th Oct., 1882
President Association of O. L. Surveyors, D.L.S.	
Waddell, William Henry, Hamilton.	May, 1905
D.L.S.	
Wadsworth, Vernon Bayley, Toronto, 103 Bay st.	9th April, 1864
D.L.S.	
Walker, Alfred Paverley, Toronto, Room 508, Union Station, C. P. Ry., Eng. Office.....	6th Jan., 1882
D.L.S., Mem. Can. Soc. C.E.	
Wallace, James Nevin, Calgary, Alta.....	21st Feb., 1898
D.L.S., B.A., B.E. (Trin. Coll., Dublin).	
Ward, Archeson Thomas. Toronto, 703 Temple Building	10th April, 1897
Warren, James, Walkerton, P.O. Box 190....	7th Oct., 1864
D.L.S.	
Watson, John McCormack, Orillia, P.O. Box 224	13th April, 1832

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Wells, Arthur Frederick, Sandwich.	17th Feb., 1906
Wetherald, Thomas, Goderich, P.O. Box 273	12th Jan., 1856
	D.L.S., C.E.
Weekes, Abel Seneca, Glencoe	12th April, 1890
	D.L.S.
Weekes, Melville Bell, Brantford	17th Feb., 1900
	B.A.Sc. (Toronto Univ.), D.L.S.
West, Robert Francis, Orangeville	7th April, 1881
Wheelock, Charles Richard, Orangeville.....	7th Jan., 1886
	Treasurer County of Dufferin.
Whitson, James Francis, Toronto, Dept. of Lands, Forests and Mines....	9th Jan., 1886
Wiggins, Thos. Henry, Finch, Ont.....	10th Nov. 1891
	Grad. S.P.S.
Wilde, John Absalom, Sault Ste. Marie....	9th April, 18
Wilkie, Edward Thomson, Carleton Place..	11th April, 1891
	D.L.S.
Wilkins, Frederick William, Norwood, Ont.	6th Jan., 1877
	D.T.S.
Williams, David, Port Arthur.	9th April, 1864
	D.L.S.
*Winter, Henry, Thornyhurst	11th July, 1853
	D.L.S., C.E.
*Wood, Henry O., Billings Bridge	10th Oct., 1855
*Yarnold, William Edward, Port Perry, P.O. Box 44	7th April, 1854
	D.L.S.

REGISTERED AND WITHDRAWN.

The names of those who have become "Associates" under By-law No. 39 are marked *; and under By-law No. 45 are marked †.

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Anderson, John Drummond, Trail, B.C....	13th April, 1892
Anderson, William Beaumont, Ottawa, 178 Cartier st.	14th Feb., 1903
Grad. R.M.C., B.A.Sc. (McGill), M. Can. Soc. C.E., D.L.S.	
Apsey, John Fletcher, Cumberland, Md.....	6th Jan., 1886
Grad. S.P.S.	
Aylsworth, Charles Fraser, Sr., Madoc.....	2nd April, 1861
D.L.S.	
Bowman, Arthur Meyer, Mahan, Beaver Co., Pa.	11th Nov., 1887
Grad. S.P.S., Staff of U. S. Engineers.	
Bowman, Franklin Meyer, Bellevue, Allegheny Co., Pa.	11th April, 1892
Grad. S.P.S., Engineer Structural Iron Works.	
Brady, James, Victoria, B.C., P.O. Box 815..	15th July, 1862
M.E.	
Burnet, Hugh, Victoria, B.C.....	5th April, 1887
D.L.S., P.L.S. (B.C.).	
Cambie, Henry John, Vancouver, B.C.....	8th July, 1861
D.L.S., P.L.S. (B.C.).	
Carbert, J. Alfred, Medicine Hat, Assa....	7th April, 1876
Dist. Eng. and Surveyor.	
Carpenter, Henry Stanley, Collingwood....	25th Feb., 1899
D.L.S., B.A.Sc., Toronto.	
*Charlesworth, Lionel Clare, Edmonton, Alta.	14th April, 1896
Grad. S.P.S., Director of Surveys, Saskatchewan, D.L.S.	
Coleman, Richard Herbert, Toronto, Can. Co. Offices, Imperial Bank Chambers	6th Oct., 1877

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Drewry, William Stewart, Ottawa, Dept. of the Interior	5th April, 1883 D.L.S.
Ducker, William A., Winnipeg, Man.....	6th April, 1882 D.L.S., P.L.S. (Man.), Swamp Lands Comm'r.
Edwards, George, Thurso, P.Q.....	6th Jan., 1866 D.L.S.
*Ellis, Henry Disney, Kuching, Sarawak, Borneo	7th April, 1877 D.L.S., Commissioner of Pub. Works and Surveys.
Galbraith, John, Toronto, School of Prac. Science.....	13th April, 1875 M.A., D.L.S., Prof. Engineering S.P.S.
Gibbons, James, Ottawa, Dept. of the Int..	15th April, 1890 Grad. S.P.S., Dominion Topographical Surveyor.
Gibson, George, St. Catharines.....	10th April, 1860 D.L.S.
Gibson, Harold Holmes, Jackson, Kentucky..	8th Sept., 1891
*Harris, John Walter, Winnipeg, Man.....	6th Oct., 1866 P.L.S. (Man.), D.L.S., Assessment Com.
*Harvey, Thomas Alexander, 239 Vernon ave., Long Island, N. Y. City.	13th Nov., 1893
Henderson, Eder Eli, Henderson P.O., Maine.	7th April, 1887 Grad. S.P.S.
Hermon, Ernest Bolton, Vancouver, B.C.....	7th Oct., 1885 P.L.S. (B.C.), D.L.S.
Innes, William Livingstone, Simcoe.....	14th April, 1892 C.E. (Toronto Univ.).
Jephson, Richard Jermy, Winnipeg, Man..	7th April, 1877 P.L.S. (B.C.), D.L.S.
Johnson, Sydney Munnings, Greenwood, B.C.	9th Nov., 1895
Johnston, Robert Thornton, The Riviera, 142 st. and 7th ave., N. Y. City.....	9th April, 1899
Kennedy, James Henry, Keremeos, B.C.....	7th April, 1887 C. E. (Toronto Univ.), Chief Engineer V. V. & E. R. & N. Co.
*Kippax, Hargreaves, Huron, South Dakota.	7th July, 1877 C.E. (Toronto Univ.), Assistant to Surveyor-General.

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Kirk, John Albert, Revelstoke, B.C.....	6th July, 1877 D.L.S., P.L.S. (B.C.).
Klotz, Otto, 437 Albert st., Ottawa.....	6th Jan., 1867 Dom. Top. Surveyor, C.E. (Mich. Univ.), LL.D.
Lane, Andrew, Sparrow's Point, Md.....	4th April, 1895 Grad. S.P.S., Draftsman Maryland Steel Co.
Lendrum, Robert Watt, Stratheona, Alta....	8th Jan., 1874 D.L.S.
Livingstone, Thomas Chisholm, (address not known)	10th Jan., 1859 D.L.S.
MacLeod, Henry Augustus F., Ottawa, 340 Cooper st.	11th Oct., 1856 D.L.S., C.E.
MacPherson, Duncan, Montreal	9th Jan., 1884 Grad. R.M.C., M.I.C.E., Mem. Can. Soc. C.E., Div. Eng. East Div. C.P.R., D.L.S.
McCulloch, Andrew, Lake Nelson, B.C.....	Grad. S.P.S., Assoc. Mem. Can. Soc. C.E., City Engineer.
McLennan, Roderick, Toronto	20th Jan., 1846
Magrath, Charles Alexander, Lethbridge, Alta.	1st Nov., 1881 B.A.Sc. (McGill), D.L.S., P.L.S. (B.C.).
Marshall, James, Blyth.	6th Oct., 1866 D.L.S.
Meadows, William Walter, Windsor.....	21st Feb., 1898 D.L.S., Grad. S.P.S.
Miles, Charles Falconer, 268 Triangle st., Buffalo, N.Y.	13th Jan., 1862
Moore, Thos. Alexander, London South....	12th Nov., 1892
Munro, John Vicar, New York, N.Y., 359 West 31st st.	9th April, 1895
†Paterson, James Allison.	5th April, 1878 C.E., Mem. Can. Soc. C.E.
Pearce, William, Calgary, Alta.....	12th Oct., 1872 D.L.S., P.L.S. (B.C.), Asst. B.C. Land Commissioner for C.P.R.

NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Peterson, Peter Alexander, Montreal, P.Q. D.L.S., C.E. (Toronto Univ.)	16th July, 1863
Ponton, Archibald William, Macleod, Alta. D.L.S.	9th April, 1880
Purvis, Frank, Mesa City, Arizona.....	7th April, 1875
Reid, John Lestock, Prince Albert, Sask.... D.L.S.	8th April, 1870
Reiffenstein, James Henry, Ottawa, Dept. of the Interior.....	16th April, 1873 D.L.S.
Reilly, William Robinson, London, 361 Simeoe st.	7th April, 1881 D.L.S., P.L.S. (Man.).
Reynolds, Samuel Henry, Winnipeg.....	17th July, 1880
Ritchie, Nelson Thomas, Kipiegan, Man..... P.L.S. (Man.)	9th Nov., 1888
Robinson, Franklin Joseph, Regina..... Grad. S.P.S., D.L.S., Dep. Min. Pub. Works.	21st Feb., 1893
*Ross, Joseph Edmund, New Westminster, B.C.	11th Nov., 1890 D.L.S., P.L.S. (B.C.).
Sanderson, Daniel Leavens, Coral, Mich.....	4th Oct., 1882
Saunders, Bryce Johnston, Edmonton, Alta— B.A.Sc. (McGill), D.L.S.	7th Jan., 1885
Shaw, Charles Aeneas, Greenwood, B.C..... P.L.S. (B.C.).	6th Oct., 1877
Sherman, Ruyter Stinson, Mission City, B.C. P.L.S. (B.C.).	12th April, 1890
Smith, Henry, Toronto, Dept. of Lands, Forests and Mines.....	8th Nov., 1861 D.L.S., Mem. Can. Soc. C.E.
Stewart, Elihu, Ottawa, Dept. of Interior.. D.L.S., Chief Inspector of Forestry.	8th April, 1872
*Stewart, Louis Beaufort, Toronto, School of Prac. Science	6th April, 1882 Dom. Top. Surveyor, Professor of Surveying.
Tracey, Thomas Henry, Vancouver, B.C.... C.E., P.L.S. (B.C.), D.L.S.	8th April, 1870

LIST OF MEMBERS.

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NAME AND P.O. ADDRESS.	DATE OF ADMISSION BY BOARD.
Vicars, John Richard Odium, Kamloops, B.C.	5th Jan., 1887
P.L.S. (B.C.), D.L.S.	
Wallace, Charles Hugh, 36 Dame st., Dublin, Ireland	9th Nov., 1889
C.E. (Trin. Coll., Dublin), Dom. Top. Surveyor.	
Wheeler, Arthur Oliver, Calgary, Alta.....	8th July, 1881
P.L.S. (B.C.), D.L.S., Topographer, Dept. of Interior.	
Wicksteed, Henry King, Cobourg	7th Jan., 1886
D.L.S., C.E.	

SUMMARY.

Active members subject to dues.....	228
Active members exempted from dues.....	17
Withdrawn from practice (including nine Associates) ..	70
Dead	67
Total number enrolled since incorporation.....	382

DECEASED MEMBERS.

NAME.	LATE RESIDENCE.	DATE OF P.L.S. CERTIFICATE.	DATE OF O.L.S. REGISTRATION.	DIED.
Abrey, George Brockitt.....	Toronto Junction.....	10th January, 1860.....	1892.....	25th June, 1906.
Barrett, Russell H.....	Pembroke.....	.....	14th February, 1903.....	30th January, 1905.
Bigger, Samuel Howell.....	Ottawa.....	.....	20th January, 1904.....	7th July, 1906.
Bolger, Francis.....	Lindsay.....	10th October, 1863.....	1892.....	3rd November, 1895.
Bolger, Thomas Oliver.....	Kingston.....	6th July, 1865.....	1892.....	....., 1901.
Bolton, Jesse Nunn.....	Toronto.....	6th April, 1867.....	.....	20th September, 1895.
Bowman, Leander Meyer.....	Toronto.....	14th April, 1892.....	1892.....	14th May, 1900.
Brown, David Rose.....	Cornwall.....	10th October, 1850.....	1892.....	10th June, 1897.
Burke, William Robert.....	Ingersoll.....	5th April, 1878.....	1892.....	..... August, 1905.
Caddy, Cyprian F.....	Campbellford.....	10th July, 1860.....	1892.....	26th September, 1897.
Caddy, Edward C.....	Cobourg.....	18th December, 1846.....	1892.....	....., 1905.
Cheeseman, Thos.....	Mitchell.....	11th July, 1856.....	1892.....	17th May, 1897.
Coad, Richard.....	Glencoe.....	8th October, 1879.....	1882.....	22nd January, 1908.
Creswick, Henry.....	Barrie.....	8th July, 1864.....	1892.....	19th October, 1897.
Cromwell, Joseph M. O.....	Perth.....	1st October, 1846.....	1892.....	December, 1900.
Davidson, Walter Stanley.....	Sarnia.....	9th April, 1884.....	1882.....	8th November, 1907.
Davis, John.....	Alton.....	5th April, 1878.....	1892.....	3rd April, 1897.
Deane, Michael.....	Windsor.....	26th May, 1848.....	1892.....	22nd March, 1898.
DeGurse, Joseph.....	Windsor.....	5th April, 1883.....	1892.....	....., 1908.
Dobbie, Thos. Wm.....	Tilsonburg.....	11th July, 1856.....	1892.....	16th June, 1904.
Filmore, Stanley H.....	St. Thomas.....	.....	17th February, 1902.....	....., 1901.
FitzGerald, James William.....	Peterborough.....	13th July, 1857.....	1892.....	27th July, 1899.
Foster, Frederick Lucas.....	Toronto.....	9th April, 1863.....	1892.....	..... April, 1898.
Fowle, Albert.....	Orillia.....	5th August, 1847.....	1892.....	....., 1905.
Fraser, Charles.....	Wallaceburg.....	.....	1892.....	17th April, 1893.
Gibbs, Thomas Fraser.....	Adolphustown.....	31st May, 1841.....	.....	14th December, 1898.
Gilliand, Thomas Brown.....	Eugenia.....	11th July, 1868.....	25th January, 1890.....	20th December, 1903.
Gilmour, Robert.....	Toronto.....	11th April, 1856.....	1892.....	7th May, 1905.
Hanning, Clement George.....	Preston.....	19th July, 1858.....	1892.....
Haskins, William.....	Hamilton.....	5th July, 1855.....	1892.....

DECEASED MEMBERS.

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Hermon, Royal Wilkinson	Rednersville	13th July, 1857.....	1892	9th February, 1907.
Hewson, Thomas Ringwood.....	Hamilton	6th July, 1877.....	1892 .....	.....	21st October, 1898.
Howitt, Alfred	Gourcock	12th January, 1856.....	1892 .....	.....	6th May, 1896.
Kains, Tom	Victoria	11th July, 1873.....	.....	.....	....., 1901.
Kirk, Joseph Green.....	Stratford	16th February, 1843.....	1892 .....	.....	22nd January, 1900.
Lynch-Staunton, Francis H.....	Hamilton	11th October, 1856.....	1892 .....	.....	11th June, 1899.
Macdougall, Allan Hay.....	Port Arthur	4th April, 1859.....	1892 .....	.....	— February, 1906.
MacMillan, James Alexander.....	Calgary	6th January, 1877.....	24th	December, 1894.	.....
MacNab, John Chisholm	Hamilton	8th January, 1880.....	1894 .....	.....	16th October, 1897.
McAree, John.....	Toronto	6th April, 1867.....	1894 .....	.....	12th December, 1903.
McCallum, James.....	Fort Francis	30th March, 1849.....	1894 .....	.....	— July, 1900.
McGeorge, Wm. Graham.....	Chatham.....	8th January, 1866.....	1892 .....	.....	1st July, 1906.
McLatchie, John.....	Nelson, B. C.....	9th January, 1864.....	1892 .....	.....	3rd February, 1908.
Malcolm, Sherman Morgan.....	Blenheim.....	11th October, 1858.....	1894 .....	.....	13th January, 1899.
Ogilvie, John Henry	Rat Portage	8th April, 1876.....	24th	April, 1894.	21st September, 1898.
Pedder, James Robert	Doon.....	10th November, 1891.....	23rd	December, 1892.	17th January, 1897.
Pope, Robert Tyndal.....	Ireland.....	13th April, 1875.....	.....	.....	....., 1905.
Proudfoot, Hart William	Saskatoon, Assa.....	6th May, 1905.....	.....	.....	31st March, 1906.
Reid, James Hales	Bowmanville.....	6th October, 1866.....	1892 .....	.....	22nd December, 1899.
Robinson, William.....	London.....	— May, 1846.....	1892 .....	.....	11th October, 1894.
Rubidge, Tom S.....	Cornwall	9th February, 1849.....	1892 .....	.....	— June, 1904.
Sankey, Villiers	Toronto.....	28th September, 1843.....	1892 .....	.....	10th July, 1905.
Schofield, Milton C.....	Guelph.....	7th October, 1864.....	1892 .....	.....	19th February, 1908.
Simpson, George Albert.....	Winnipeg.....	.....	1892 .....	.....	8th January, 1905.
Spry, W.....	Brantford	14th April, 1866.....	1896 .....	.....	....., 1906.
Squire, Richard Herbert	Sault Ste. Marie.....	9th April, 1889.....	1892 .....	.....	....., 1908.
Steele, Edward Chas.....	Rockwood	30th November, 1838.....	1892 .....	.....	March, 1908.
Strange, Henry	B.C.....	5th October, 1876.....	1892 .....	.....	....., 1897.
Strathern, John	Tilbury Centre	7th January, 1886.....	1892 .....	.....	— December, 1900.
Tiernan, Joseph Martin.....	Chicago.....	14th January, 1861.....	1892 .....	.....	— December, 1896.
Thomson, Augustus Clifford.....	Stratford	7th April, 1883.....	1892 .....	.....	30th January, 1905.
Van Buskirk, William Fraser.....	Ossowo.....	13th April, 1858.....	1892 .....	.....	....., 1901.
Wagner, William.....	Simcoe	25th April, 1842.....	1892 .....	.....	14th March, 1895.
Walsh, Thomas William.....	Orangeville....., 1856.....	1892	4th July, 1897.
Wheelock, Charles John.....	20th May, 1906.
Willson, Alfred.....

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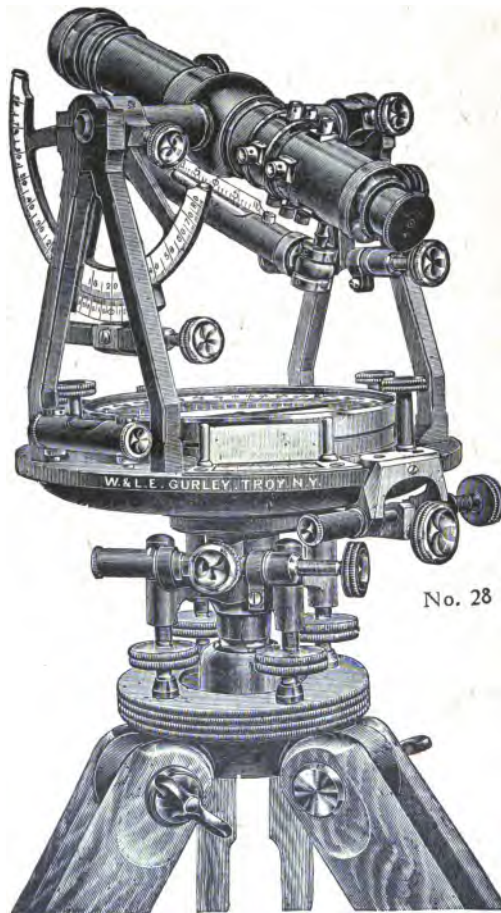
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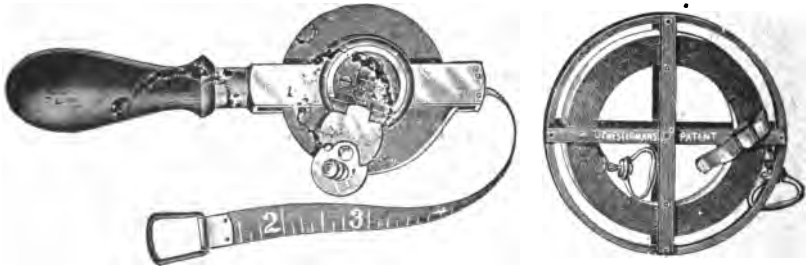


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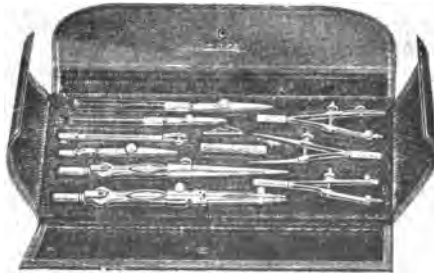
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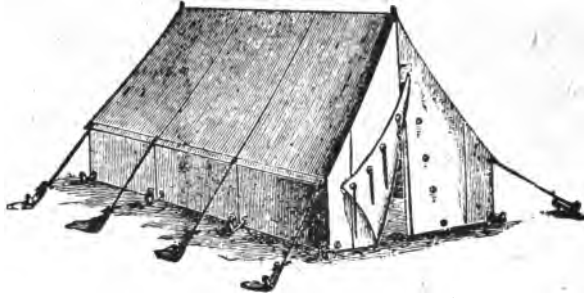
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